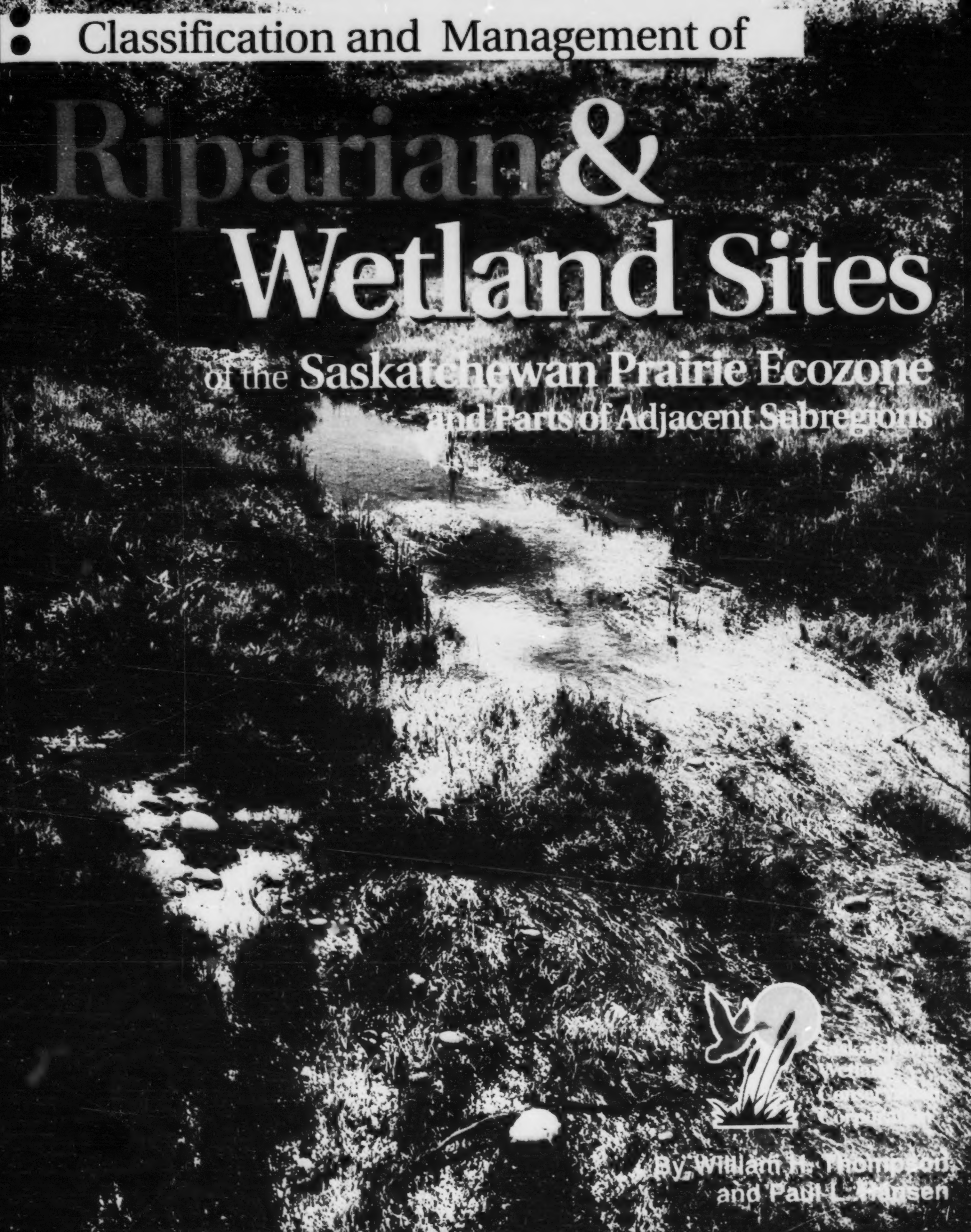

Classification and Management of Riparian & Wetland Sites of the Saskatchewan Prairie Ecozone and Parts of Adjacent Subregions

By William H. Thompson
and Paul L. Hansen

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March 2001

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GENERAL TABLE OF CONTENTS

Introduction 1

Saskatchewan Ecoregions within the Study Area 10

Development of the Ecological Site Classification 14

List of Types 20

Use of the Classification 27

Key to Riparian and Wetland Sites of the Saskatchewan Prairie Ecozone 30

Descriptions of Conifer Tree Types 41

Descriptions of Deciduous Tree Types 45

Descriptions of Willow Shrub Types 128

Descriptions of Non-Willow Shrub Types 173

Descriptions of Sedge Types 212

Descriptions of Non-Sedge Types 223

Other Types (Not Described) 269

Literature Cited 270

Glossary 289

DETAILED TABLE OF CONTENTS

Introduction 1
  Historical Overview of Riparian and Wetland Areas 1
  Why Is There Suddenly a Problem? 2
  Benefits of a Healthy and Productive Riparian Area 2
    Background 2
    Vegetation 2
    Water Quality and Quantity 3
    Fisheries and Aquatics 3
    Wildlife Uses 3
    Livestock Grazing 4
    Summary 5
  The Problem of Defining Wetlands in the arid portions of western North America 6
    Wetland Definitions 6
  Running Water (Lotic) Wetlands vs. Still Water 7
    Lotic Wetlands 8
    Lentic Wetlands 8
  Wetland Soils 8
    Soil Forming Factors 8
Saskatchewan Ecoregions within the Study Area 10
  Topography and Landform 12
    Mixed Grassland Ecoregion 12
    Moist Mixed Grassland Ecoregion 12
    Aspen Parkland Ecoregion 12
    Cypress Upland Portion of the Montana Ecoregion 12
  Climate 12
    Mixed Grassland Ecoregion 12
    Moist Mixed Grassland Ecoregion 12
    Aspen Parkland Ecoregion 13
    Cypress Upland Portion of the Montana Ecoregion 13
  Soils 13
    Mixed Grassland Ecoregion 13
    Moist Mixed Grassland Ecoregion 13
    Aspen Parkland Ecoregion 13
    Cypress Upland Portion of the Montana Ecoregion 14
Development of the Ecological Site Classification 14
  Background 14
  Field Methods 14
  Office Methods 15
  Taxonomic Considerations 16
    Cottonwoods 16
  Ecological Equivalents 16
  Ecological Terms and Concepts 16
List of Types 20
  Geographic Distribution of Types 20
Use of the Classification 27
  Management Interpretations 27
  Successional Relationships 28

Developing Reasonable and Attainable Management Goals and Objectives 28

DETAILED TABLE OF CONTENTS (Cont.)

Key to Riparian and Wetland Sites of the Saskatchewan Prairie Ecozone 30
Background 30
Instructions 30
Key to Lifeform Groups 31
Key to Coniferous Tree Types 32
Key to Deciduous Tree Types 32
Key to Shrub Types 34
Key to Willow Shrub Types 34
Key to Non-Willow Shrub Types 36
Key to Herbaceous Types 37
Key to Sedge Types 38
Key to Non-Sedge Types 38

DESCRIPTIONS OF TYPES

Coniferous Tree Types 41
Picea glauca/Cornus stolonifera Habitat Type
(White Spruce/Red-osier Dogwood Habitat Type) 41
Deciduous Tree Types 45
Acer negundo/Prunus virginiana Habitat Type
(Manitoba Maple/Choke Cherry Habitat Type) 45
Fraxinus pennsylvanica/Prunus virginiana Habitat Type
(Green Ash/Choke Cherry Habitat Type) 52
Populus balsamifera/Cornus stolonifera Community Type
(Balsam Poplar/Red-osier Dogwood Community Type) 62
Populus balsamifera/Herbaceous Community Type
(Balsam Poplar/Herbaceous Community Type) 69
Populus balsamifera/Recent Alluvial Bar Community Type
(Balsam Poplar/Recent Alluvial Bar Community Type) 76
Populus balsamifera/Symphoricarpos occidentalis Community Type
(Balsam Poplar/Buckbrush Community Type) 81
Populus deltoides/Cornus stolonifera Community Type
(Plains Cottonwood/Red-osier Dogwood Community Type) 89
Populus deltoides/Herbaceous Community Type
(Plains Cottonwood/Herbaceous Community Type) 95
Populus deltoides/Recent Alluvial Bar Community Type
(Plains Cottonwood/Recent Alluvial Bar Community Type) 101
Populus deltoides/Symphoricarpos occidentalis Community Type
(Plains Cottonwood/Buckbrush Community Type) 107
Populus tremuloides/Cornus stolonifera Habitat Type
(Aspen/Red-osier Dogwood Habitat Type) 114
Populus tremuloides/Herbaceous Community Type
(Aspen/Herbaceous Community Type) 119
Populus tremuloides/Symphoricarpos occidentalis Community Type
(Aspen/Buckbrush Community Type) 123

DETAILED TABLE OF CONTENTS (Cont.)

Willow Shrub Types 128
Salix amygdaloides Community Type
(Peach-leaved Willow Community Type) 128
Salix bebbiana/Carex atherodes Habitat Type
(Beaked Willow/Awned Sedge Habitat Type) 132
Salix bebbiana/Cornus stolonifera Habitat Type
(Beaked willow/Red-osier Dogwood) Habitat Type 138
Salix bebbiana Community Type
(Beaked Willow Community Type) 144
Salix exigua Community Type
(Sandbar Willow Community Type) 149
Salix lutea/Cornus stolonifera Habitat Type
(Yellow Willow/Red-osier Dogwood) Habitat Type 155
Salix lutea Community Type
(Yellow Willow Community Type) 160
Salix petiolaris/Carex atherodes Habitat Type
(Basket Willow/Awned Sedge Habitat Type) 163
Salix petiolaris/ Cornus stolonifera Habitat Type
(Basket Willow/Red-osier Dogwood Habitat Type) 166
Salix petiolaris Community Type
(Basket Willow Community Type) 170
Non-Willow Shrub Types 173
Amelanchier alnifolia Community Type
(Saskatoon) Community Type 173
Artemisia cana/Agropyron smithii Habitat Type
(Silver Sagebrush/Western Wheat Grass Habitat Type) 176
Betula occidentalis Community Type
(Water Birch Community Type) 181
Crataegus rotundifolia Community Type
(Round-leaved Hawthorn Community Type) 186
Elaeagnus commutata Community Type
(Silverberry Community Type) 190
Prunus virginiana Community Type
(Choke Cherry Community Type) 194
Rosa woodsii Community Type
(Common Wild Rose Community Type) 197
Sarcobatus vermiculatus/Agropyron smithii Habitat Type
(Greasewood/Western Wheat Grass Habitat Type) 200
Shepherdia argentea Community Type
(Thorny Buffaloberry Community Type) 203
Symphoricarpos occidentalis Community Type
(Buckbrush Community Type) 207
Sedge Types 212
Carex aquatilis Habitat Type
(Water Sedge Habitat Type) 212
Carex atherodes Habitat Type
(Awned Sedge Habitat Type) 216
Carex lanuginosa Habitat Type
(Woolly Sedge Habitat Type) 219

DETAILED TABLE OF CONTENTS (Cont.)

Non-Sedge Types 223
Agropyron smithii Habitat Type
(Western Wheat Grass Habitat Type) 223
Bromus inermis Community Type
(Awnless Brome Community Type) 227
Calamagrostis stricta Community Type
(Narrow Reed Grass Community Type) 230
Deschampsia cespitosa Habitat Type
(Tufted Hair Grass Habitat Type) 233
Distichlis stricta Habitat Type
(Salt Grass Habitat Type) 236
Eleocharis palustris Habitat Type
(Creeping Spike-rush Habitat Type) 238
Hordeum jubatum Community Type
(Foxtail Barley Community Type) 241
Juncus balticus Community Type
(Wire Rush Community Type) 243
Phalaris arundinacea Habitat Type
(Reed Canary Grass Habitat Type) 245
Phragmites australis Habitat Type
(Reed Habitat Type) 248
Poa pratensis Community Type
(Kentucky Bluegrass) Community Type) 250
Polygonum coccineum Community Type
(Water Smartweed Community Type) 253
Puccinellia nuttalliana Habitat Type
(Nuttall's Salt-meadow Grass Habitat Type) 254
Salicornia europaea Community Type
(Samphire Community Type) 256
Scirpus acutus Habitat Type
(Great Bulrush Habitat Type) 258
Scirpus paludosus Habitat Type
(Prairie Bulrush Habitat Type) 260
Scirpus pungens Habitat Type
(Three-square Rush Habitat Type) 262
Scolochloa festucacea Habitat Type
(Spangletop Habitat Type) 265
Typha latifolia Habitat Type
(Common Cattail Habitat Type) 267
Other Types (Not Described) 269

INTRODUCTION

Riparian and wetland areas[1] occupy an important position on the landscape and in the life of western North America. Their importance far exceeds what might be expected from their relatively small area. Riparian and wetland areas are the green zones bordering lakes, reservoirs, estuaries, potholes, springs and seeps, peatlands, wet meadows, vernal pools, and ephemeral, intermittent, or perennial streams. The riparian zone is the interface, or linkage, between the upland (terrestrial) zone and the deep water (aquatic) zone. Riparian and wetland ecosystems are important islands and/or corridors of diversity and higher productivity within extensive upland systems. They provide a functional link between aquatic and terrestrial systems. They are of prime importance to water quality, water quantity, stream stability, and fish habitat. Abundant water, forage, and habitat attract a proportionately greater amount of use and conflict than occurs on adjacent uplands. They are vital to the livestock grazing industry; they so often contain concentrations of minerals important to the mining industry; and many may be developed into high quality agricultural farmland. Most riparian and wetland sites provide critical habitat for many species and support a greater concentration of wildlife, human recreation, and other human activities than any other location on the landscape.

Riparian and wetland areas in western North America tend to have the following characteristics (Thomas and others 1979): 1) they create well-defined habitat zones within the much drier surrounding areas; 2) they make up a minor proportion of the overall area (between 1-5 percent); 3) they are generally more productive in terms of total biomass than the remainder of the area; and 4) they are a critical source of biological diversity. Both density and diversity of species tend to be higher at the land/water ecotones than in adjacent uplands, especially in the arid portions of western North America.

In contrast to their degree of importance, the structure, function, and management requirements of riparian and wetland plant communities are less well understood than are those of most other areas. They have often been overlooked, ignored, or considered only as minor inclusions of larger systems, terrestrial or aquatic. Grazing, timber harvest, transportation corridors, mining, farming, and residential development can drastically alter these communities. Consequently, management of riparian and wetland areas has become—and will continue as—a major issue. Multi-resource opportunities, multi-disciplinary concerns, and multi-ownership patterns within riparian and wetland areas demand a high level of coordination and cooperation among users to meet society's needs from these sites.

Historical Overview of Riparian and Wetland Areas

The first lands settled by European immigrants were frequently in or near the riparian zone. Western riparian and wetland areas provided an abundance of game, fish, and other natural resources needed by settlers until they could bring uplands into production. Watercourses often provided the primary means of transporting supplies and goods. Water power was harnessed to mill grain, saw wood, and perform other tasks. The fertile, alluvial soils that provided excellent wildlife habitat also became excellent farmlands after being drained and cleared. Water from the streams, rivers, lakes, or ponds was diverted to irrigate cropland. Trees in the riparian zone became fence posts, building materials, and fuel for everything from the home and the forge to steamboats that brought the settlers.

Increased environmental awareness since the 1960's has raised major concerns about the loss of wetlands due to developments and changes in riparian areas. Agricultural expansion has been the major cause of wetland conversion in Canada. It is estimated that by 1976 a total of 1.2 million ha (3 million ac) of wetland had been converted to agriculture, representing a loss of over 70 percent of prairie wetlands in Canada (Environment Canada 1986).

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[1] "Riparian" and "wetland" are not synonyms, and usage varies greatly. We often use the terms in combination when speaking of general situations that include both.

The pothole region of the Canadian prairie provinces has been estimated to produce five of every eight ducks shot by hunters in North America, while this same area in 1969 was producing 98 of every 100 bushels of Canadian wheat (Lodge 1969). These facts indicate the importance of this part of the prairie landscape, and this example illustrates just one of the myriad conflicts of interest that can arise. Since 1969, many more prairie wetlands have been converted to the economically important production of small grains. In addition to draining of wetlands, many other human activities have greatly changed the structure and function of riparian and wetland areas. Improper timber harvesting and mining have caused severe impacts on the riparian zone in many regions. Livestock have often been grazed in riparian zones almost year-round. Many wetlands and aquatic systems near farmsteads have become highly eutrophic from barnyard and feedlot runoff. Fires have been suppressed whenever possible, allowing dead vegetation to accumulate. Many bottomlands of ephemeral depressions and riparian areas have been cultivated. Hay has been mowed in some wetlands as often as possible. Some wetlands have been burned in the fall to reduce the amount of snow trapped or to discourage the spread of "weeds." Plowing for row crops, cultivation of steeper slopes, and summer fallowing have caused mobilization of topsoil into riparian areas, further changing their vegetation potential and species composition and abundance (Kantrud 1986). Dissolved salts and residues from agricultural chemicals have migrated into many wetland and riparian areas, and irrigation has altered the hydrology and vegetation of wetlands.

Why Is There Suddenly a Problem?

Research over the past few decades has demonstrated many economic and social values that are enhanced by the proper function of riparian and wetland systems. We have learned some of the ways that impacts are made on these systems, and how difficult restoration can sometimes be. It is in our best interest as managers and landowners to make use of the growing body of knowledge at hand. One such asset is *Caring for the green zone* (Adams and Fitch 1998), a guidebook for ranchers and livestock producers on how to manage most effectively the riparian areas within their rangelands.

Benefits of a Healthy and Productive Riparian Area

Background—In a broad sense, the "health" of a riparian or wetland area may be defined as its ability to perform its normal functions. These functions include sediment filtering, streambank building, storing water, aquifer recharging, providing fish and wildlife habitat, and dissipating stream energy. Evaluating a stream's health requires consideration of upstream and adjacent management. For example, although noxious weeds such as *Cirsium arvense* (Canada thistle) or *Euphorbia esula* (leafy spurge) along a streambank may help to trap sediment and bind the soil for maintaining the streambanks, their presence would be a management concern and an indication of compromised health.

Vegetation—Conditions of vegetation along streams is a major component of the health of riparian ecosystems. Healthy riparian vegetation stabilizes streambanks, making them less likely to erode during high flows; influences bank morphology; and aids in reducing streambank damage from ice and animal trampling (Karr and Schlosser 1978, Platts 1979, Marlow and Pogacnik 1985). The roots of trees, shrubs, and herbaceous plants stabilize the streambanks and support overhangs, which provide cover for aquatic animals. Much of a stream's sediment load, particularly during high flows, can result from bank erosion. Schlosser and Karr (1981) found that levels of suspended solids increased quickly during storms where the streambanks lacked vegetation. On more stable channel sections having well-developed riparian vegetation, they found levels of suspended solids increased at a slower rate. Vegetation along streams provides flow resistance, which reduces velocity, and therefore the erosive energy, of overbank floods (Schumm and Meyer 1979).

Riparian vegetation provides shade, lowering water temperatures, which can prevent harm to native aquatic life (Meehan and others 1977). Lower temperature increases the water's oxygen-carrying capacity. Vegetation removal can cause water temperature to increase, adversely affecting the stream biota, such as the many species of trout that require well-oxygenated water.

Water Quality and Quantity—Riparian areas can filter nutrients, thereby improving water quality. In agricultural watersheds, nutrient filtering in riparian areas can help control agricultural nonpoint-source pollution (Lowrance and others 1985). Sediment deposition is a natural process that occurs during flooding; therefore, upland erosion can increase the sediment load and deposition in riparian areas and wetlands. Such deposition can alter surface soils, the hydrology, and the vegetation community in these low-lying sites (Lowrance and others 1985). Riparian vegetation also reduces sediment and nutrient transport in a number of ways. Roots, especially those of woody vegetation, help stabilize streambanks by holding soil intact. Vegetation also increases hydraulic resistance to flow, thereby lowering flow velocities and causing sediment deposition.

Another important role of wetland vegetation is uptake and storage of nutrients. Wetland areas are more productive because of the nutrient and water subsidies provided by periodic flooding (Brinson and others 1980). Nutrient uptake into leaves and other deciduous plant parts provides short-term storage. However, because deciduous plant parts drop each year, these nutrients are soon available again. High litterfall and moist conditions in riparian and wetland areas result in soils higher in organic matter than soils on upland sites.

Riparian and wetland ecosystems generally serve to dissipate water and wind energy that can damage agricultural land. In the Great Plains, gallery forests are important natural windbreaks. Riparian and wetland areas are also important in dissipating the energy of runoff from agricultural land. In general, surface runoff slows as it flows through the riparian zone, causing sediment deposition and diminishing the water's erosive potential.

Loss of wetlands has contributed to the change from perennial to intermittent flow in some streams. Many alluvial aquifers in western North America are maintained by infiltration of upland runoff in the stream channel or alluvial deposits. These aquifers provide an important source of water for human use. Water storage in such aquifers was once partially responsible for maintaining baseflow in western rivers, which are now dry beds much of the year.

Fisheries and Aquatics—Riparian areas are important to instream ecosystems. Riparian vegetation produces most of the detritus that provides as much as 90 percent of the organic matter necessary to support stream (aquatic) communities (Campbell and Franklin 1979). In forested ecosystems, up to 99 percent of the stream energy input may come from bordering riparian vegetation with only 1 percent coming from instream photosynthesis by algae and mosses (Cummins 1974).

Wildlife Uses—The riparian and wetland ecosystems are likely the most productive wildlife habitats, benefiting the greatest number of species (Ames 1977, Hubbard 1977, Patton 1977). Examples of the wildlife values of riparian and wetland habitats are numerous. In western Montana 59 percent of the land bird species use riparian and wetland habitats for breeding purposes and 36 percent of those breed only in riparian or wetland areas (Mosconi and Hutto 1982). Thomas and others (1979) reported that of the 363 terrestrial species known to occur in the Great Basin of southeastern Oregon, 299 either directly depend on riparian or wetland areas, or utilize them more than any other habitats. The influence of riparian and wetland ecosystems on wildlife is not limited to animal species that are restricted to the riparian or wetland zone. Population densities of birds in upland habitat adjacent to the riparian or wetland zones are influenced by the presence of riparian or wetland areas (Carothers 1977). When a riparian or wetland area is destroyed or changed by humans, not only are the riparian and wetland species of the area adversely influenced, but wildlife productivity in the adjacent uplands suffers as well.

Livestock Grazing—Riparian and wetland areas are vitally important to the livestock industry. Livestock tend to congregate in riparian and wetland areas and utilize this vegetation much more intensively than that of adjacent uplands (Kauffman and Krueger 1984). Although riparian and wetland areas cover only about 1-2 percent of the summer range area of the Pacific Northwest, they can potentially produce 20 percent of the summer range forage (Reid and Pickford 1946, Roath and Krueger 1982).

In many parts of the western North America rangeland, the landscape has been so altered by more than a century of livestock grazing that it is now difficult to visualize what it looked like in the mid nineteenth century, particularly its riparian segments (Ehrhart and Hansen 1997). Cattle tend to prefer riparian and wetland areas for the same reasons other animals do: availability of water, shade, and the quality and variety of forage (Ames 1977, Severson and Boldt 1978). Concerning forage quality, many of the various sedge species retain relatively constant crude protein levels until the first killing frost. Several sedges found in riparian and wetland zones of the Pacific Northwest exceed key upland forage species in sustained protein and energy content (Kauffman and Krueger 1984).

Grazing can have a considerable effect on vegetation, resulting in decreased vigor and biomass and an alteration of species composition and diversity (Ames 1977, Bryant and others 1972). Improper livestock use of riparian areas can affect the streamside environment by changing, reducing, or eliminating vegetation bordering the stream. Channel morphology can be changed by widening and shallowing of the streambed, gradual stream channel trenching, or braiding, depending on soils and substrate composition (Marcuson 1977, Platts 1979). Water quality itself can be altered by increasing water temperatures, nutrients, suspended sediments, and bacterial counts, and by altering the timing and volume of water flow (Platts 1979, Kauffman and Krueger 1984). Overgrazing can cause bank sloughing, accelerated sedimentation, and subsequent silt degradation of spawning and food producing areas (Platts 1979, Platts 1981). Hayes (in Kauffman and Krueger 1984) found that high forage removal, high amount of foraging time along banks, and high percentages of palatable sedges along the bank all contributed to a significant increase in the probability of sloughing occurring during the grazing season.

The effects of excessive use of woody vegetation can also have a negative affect on the overall health of riparian and wetland areas (Kauffman and Krueger 1984). Knopf and Cannon (1982) found that excessive cattle grazing significantly altered the size, shape, volume, and quantities of live and dead stems of willows. Cattle grazing also was found to influence the spacing of plants and the width of the riparian or wetland zone. Marcuson

(1977) found shrub production to be 13 times greater in an ungrazed area than in a severely overgrazed area. Canopy cover was 82 percent greater in the ungrazed area. However, investigators have found that a change in management of the site can dramatically restore lost shrub canopy cover (Crouch 1979, Davis 1982, Kauffman and Krueger 1984, Hansen 1985).

Improper livestock grazing can adversely affect these sites for wildlife, significantly reducing bird species composition and foraging guilds, as well as small mammal density and diversity (Kauffman and Krueger 1984). Alderfer and Robinson (1949), Bryant and others (1972), Orr (1960), and Rauzi and Hanson (1966) all found soil compaction increased linearly with increases in grazing intensity.

However, recent advancements in grazing systems have successfully rehabilitated many riparian and wetland areas. The damage caused by hot season use or season-long grazing is well documented (Marcuson 1977, Severson and Boldt 1978, Windell and others 1986, Platts and others 1987), but specialized grazing schemes hold promise for rehabilitating riparian and wetland areas without excluding cattle for long periods (Kauffman and Krueger 1984, Ehrhart and Hansen 1997). In a study in northeastern Oregon, Bryant (1985) found herbage production increased one- to four-fold through proper timing and intensity of grazing.

Summary—In the arid portions of western North America, riparian and wetland areas are important in the overall landscape mosaic, even though they represent a very small fraction of the total area. Having greater soil moisture than surrounding uplands, they are more productive than those areas, they add to the overall diversity of the landscape, and they attract livestock and wildlife for the forage, thermal and other cover, nesting habitat, water, and browse species they afford (Ames 1977, Severson and Boldt 1978). Because of this, riparian and wetland areas are focal points for livestock, timber, and wildlife management. Management strategies that recognize all these functions must be designed to maintain or restore the integrity of riparian and wetland communities.

Proper stewardship of a riparian and wetland areas is "money-in-the-bank" for the land manager. Proper management of riparian and wetland areas means decreased streambank erosion and floodplain losses (Gunderson 1968, Marcuson 1977), increased forage production for livestock (Pond 1961, Kauffman and Krueger 1984), an increase in wildlife and fisheries resources (Duff 1979, Van Velson 1979), increased water quantity, improved water quality, and greater recreational opportunities. Some changes to a landscape, even those with human causes, occur so slowly that individuals fail to perceive the change happening (Adams and Fitch 1998). Willows or cottonwoods are eliminated from a stream reach, or it ceases to flow all summer more years than it once did. These are changes that we can often prevent or processes that we can improve.

In the areas of rich, dark soil where groves of aspen and willow were once found around every depressional wetland, these wooded lands have been greatly reduced in favor of agricultural development. Across much of the Aspen Parkland Ecoregion, the land once occupied by the aspen and willow carried a far greater value when put into commodity production. This conversion has reduced the riparian and wetland function of those areas cleared. The loss of soil to fluvial and wind erosion, the loss of soil moisture and the soil building processes beneath woody plant canopies, the introduction of non-native species, and the loss of wildlife habitat are among the riparian and wetland functions reduced by land clearing. Such losses must count in the benefit balance sheet when consideration is made for further clearing of groveland.

The Problem of Defining Wetlands in the arid portions of western North America

Defining the boundaries of wetlands, referred to as "wetland delineation" in the United States, became important when society began to recognize wetland values (Mitsch and Gosselink 1993). In the nineteenth and early twentieth century, when wetland draining was a common practice accepted by society, a precise wetland definition was not important. Wetland draining continued unabated into the late 1960's. When laws and regulations pertaining to wetland protection began to be written, the need for precision increased, and it became apparent that definitions affected land use options.

The introductory statement of Cowardin and others (1979) remains a challenge:

> *There is no single, correct, indisputable, ecologically sound definition for wetlands, primarily because of the diversity of wetlands and because the demarcation between dry and wet environments lies along a continuum. Because reasons or needs for defining wetlands also vary, a great proliferation of definitions has arisen including structural attributes, functional considerations, and jurisdictional criteria.*

Wetland Definitions—The earliest definition of wetlands was intended for managers and scientists, particularly those concerned with waterfowl and wildlife (Shaw and Fredine 1956):

> *The term wetlands . . . refers to lowlands covered with shallow and sometimes temporary or intermittent waters. They are referred to by such names as marshes, swamps, bogs, wet meadows, potholes, sloughs, and river overflow lands. Shallow lakes and ponds, usually with emergent vegetation as a conspicuous feature, are included in the definition, but the permanent water of streams, reservoirs, and deep lakes are not included. Neither are water areas that are so temporary as to have little or no effect on the development of moist-soil vegetation.*

The definition of Shaw and Fredine (1956) established two parameters necessary for a habitat to be considered a wetland: 1) the presence of surface water, and 2) the development of moist-soil vegetation (Kent 1994). Twenty-three years later at a workshop of the Canadian National Wetlands Working Group, a definition evolved which recognized hydric soils as a third parameter, and which noted the functional attributes of wetlands (Tarnocai 1979). In addition, it expanded the previous definition of wetlands to include not only those habitats with surface water, but also those having saturated soils:

> *Wetland is defined as land having the water table at, near, or above the land surface or which is saturated for a long enough period to promote wetland or aquatic processes as indicated by hydric soils, hydrophilic vegetation, and various kinds of biological activity which are adapted to the wet environment.*

That same year, the USDI Fish and Wildlife Service adopted a definition, which also recognized wetland hydrology, hydric soils, and hydrophytic vegetation as defining parameters (Cowardin and others 1979). The USDI Fish and Wildlife Service definition is different from the Canadian definition in that a wetland does not have to exhibit characteristics of all three parameters:

> *Wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water . . . Wetlands must have one or more of the following three attributes: 1) at least periodically, the land supports predominantly hydrophytes, 2) the substrate is predominantly undrained hydric soil, and 3) the substrate is non-soil and is saturated with water or covered by shallow water at some time during the growing season of each year.*

As a summary of literature, Windell and others (1986) provide a general definition:

> *The term wetland is a catch-all that includes units on the landscape such as marshes, swamps, bogs, fens, and lowlands covered with shallow and sometimes ephemeral or intermittent waters. The term wetland also includes wet meadows, potholes, sloughs, the riparian zone, and river-overflow areas. Shallow lakes and ponds, usually with emergent vegetation as a conspicuous feature, are included in the wetland definition. Permanent waters deeper than 2 m (6.6 ft) are not included.*

Formal classification systems provide a means to clarify definitions. Such documents as *Wetland classification in western Canada* (Millar 1976) satisfy certain purposes well, while leaving other needs unmet. This work focuses on depressional wetlands and was done because of waterfowl habitat concerns that arose across North America around the middle of this century. The primary objective of *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin and others 1979) was, "to impose boundaries on natural ecosystems for the purposes of inventory, evaluation, and management." The classification provides a major contribution for upper levels of a taxonomic hierarchy. However, it did not resolve the need for a single acceptable definition for lower levels in the hierarchy—a level of primary concern for practical on-the-ground management applications.

Defining wetlands has become more difficult as greater economic stakes have increased the involvement of more politics and less science. A universally accepted wetland definition satisfactory to all users has not yet been developed because the definition depends on the objectives and the field of interest. However, wetland scientists generally agree that wetlands are characterized by one or more of the following features: 1) ***wetland hydrology,*** the driving factor common to all wetlands, 2) ***hydric soils,*** an indicator of the absence of oxygen, and 3) ***hydrophytic vegetation,*** an indicator of wetland site conditions. The problem is how to define and obtain consensus on thresholds of these three criteria or various combinations of them.

Running Water (Lotic) Wetlands vs. Still Water (Lentic) Wetlands—In the semiarid interior portions of western North America, a useful distinction has been made based on association with different aquatic ecosystems. Several authors have used lotic and lentic to separate wetlands associated with running water from those associated with still water. The following definitions represent a synthesis and refinement of terminology from Shaw and Fredine (1956), Stewart and Kantrud (1972), Boldt and others (1978), Cowardin and others (1979), American Fisheries Society (1980), Johnson and Carothers (1980), Cooperrider and others (1986), Windell and others (1986), Environmental Laboratory (1987), Kovalchik (1987), Federal Interagency Committee for Wetland Delineation (1989), Mitsch and Gosselink (1993), and Kent (1994).

Lotic wetlands are associated with rivers, streams, and drainageways. Such wetlands contain a defined channel and floodplain. The channel is an open conduit that periodically, or continuously, carries flowing water as well as dissolved and suspended material. Beaver ponds, seeps, springs, and wet meadows on the floodplain of, or associated with, a river or stream are part of the lotic wetland.

Lentic wetlands are associated with still water systems. These wetlands occur in basins and lack a defined channel and floodplain. Included are permanent (e.g., perennial) or intermittent bodies of water such as lakes, reservoirs, potholes, marshes, ponds, and stockponds. Other examples include fens, bogs, wet meadows, and seeps not associated with a defined channel.

Wetland Soils

Riparian and wetland areas are ecosystems that occupy the transition between upland and aquatic ecosystems. Within an ecosystem, soils may have a strong influence on the vegetation. These influences are often seen as differences in species composition, species coverage, or growth form, but the soil effects are often subtle compared to the primary influence of water. Most wetland scientists interpret water regimes as the timing, duration, depth, and extent of flooding (Heitmeyer and others 1991). However, this can be misleading as some riparian and wetland areas never experience inundation by floodwaters. Rather, they can remain saturated for prolonged periods by ground water.

Soil Forming Factors —Soils are dynamic natural bodies having properties derived from the combined effects of ***climate*** and ***biotic activities*** as modified by ***topography,*** acting on ***parent materials*** over ***time***. Soil forming events include both complicated reactions and comparatively simple rearrangements of material. Numerous events may take place simultaneously or sequentially that enhance or negate each other. It is important to emphasize the interdependency of all five factors on soil development. The following discussion of these five soil-forming factors have in part been expanded or modified from Brady (1984).

Parent materials of riparian and wetland soils are predominantly transported sediments. The exceptions are those seeps, springs, and occasional bogs where residual soils have developed. In most all other instances, the soils of a riparian or wetland area have developed from the lateral or vertical accretion of sediments by alluvial, colluvial, glacial, lacustrine, or, less commonly, aeolian processes. The most common, the alluvial deposits, are often stratified by particle size. The size of particles of a deposit is a direct function of the velocity of the water at the time of deposition.

All other factors held constant, the mineralogical composition of the parent material determines the rate of weathering. Soil particle size (texture) is highly correlated to mineralogical composition. Sands are largely made up of the highly weather resistant mineral quartz, whereas the vast majority of clay sized particles are dominated by secondary silicate minerals (the silicate clays). The unique electro-chemical properties and tremendous surface area of these clays serve to increase the concentration of plant available nutrients and potential rate of physical and chemical processes.

Climate is perhaps the most influential of the five soil forming factors. Climate regulates the amount of water a site receives through precipitation and evaporation. In turn, moisture content of the soil influences the rate of the physical and chemical processes involved in soil development. Water affects soil in a number of ways.

Wet soils warm more slowly in spring and cool more slowly in autumn. Water adds weight to the soil and acts as a lubricant between soil particles, making wet soils more susceptible to damage. When soils are saturated, the spaces between particles are filled with water instead of air. Saturated soils are commonly oxygen deficient. Since air (oxygen) is essential to most lifeforms, saturated soil contains fewer lifeforms than unsaturated soils. Microorganisms are the most abundant lifeforms in the soil. They feed primarily on dead plant and animal remains. Wetlands produce comparatively higher amount of plant material than adjacent upland areas, which commonly results in an accumulation of organic material at the mineral soil surface. These organic accumulations are called organic soils or in some specific instances, Histic epipedons (a characteristic of the Organic soil order). Other common characteristics of wet soils are the presence of redox depletions (gleyed soil) and redox concentrations (mottles). Redox depletions result from a state of total lack of oxygen in the soil. This state is also called a reduced condition. Iron in a reduced state (ferrous iron or soluble iron, Fe^{+2}), appears blue or gray in colour. These saturated blue or gray soils are often called gleyed soils and the reduction process in the soil is called gleization. Redox concentrations are often an indication of poorly drained soils. Redox concentrations are segregations of the remaining oxidized iron (ferric iron, Fe^{+3}), in the soil when all other iron is reduced or has been removed by leaching. They appear as red or brown soft speckles, hardened nodules, or may line the inside of pores in the soil. They vary in size, shape, and differ in colour from the dominant soil. A description of characteristics of wet soils (redoximorphic features) is given in the document *The Canadian System of Soil Classification* (Canada Soil Survey Committee 1978).

Air and soil temperatures are directly related to climate and can affect soil formation. Seasonal and diurnal temperature fluctuations (freeze and thaw) dictate the rate of physical weathering of soil particles. Cold temperatures restrict distributions of biotic communities, reduce biomass production, and retard decomposition rates. Typically, higher elevations are cooler. However, cold air ponding is common in areas where relief is great. In the absence of wind, colder air pools and valley soil and air temperatures are lower than adjacent sites at higher elevations. The effects of cold air ponding are indicated by dramatic differences in spatial distribution of vegetation.

Organic matter accumulation and decomposition, nutrient cycling, development of soil structure, soil mixing and many other processes are all enhanced or diminished by both the flora and fauna living on or within the soil.

The amount of organic matter, in either the surface horizon or accumulating at the soil surface, is greater in riparian and wetland soils than in adjacent upland soils. Much of this organic matter is intimately mixed into the soil through biological activity. This increase in organic matter gives the soil a darker colour (a higher Munsell colour value), greater fertility, and higher moisture holding capacity.

Human activities can also affect soil formation. Cutting of trees, overgrazing, cultivation, irrigation, draining, road construction, and other developments remove the natural vegetation and may affect the depth of water tables. Irrigation obviously increases the amount of water the site receives directly, while road construction, or any construction that covers or seals the soil surface, will concentrate the amount of water a site receives into a smaller area of infiltration.

Topography can enhance or diminish the effects of climate on soil formation. The most common of these effects are higher precipitation rates and lower air temperatures at higher elevations. Excess water in soils of headwater areas and V-shaped canyons is drained far more rapidly than in soils of flat alluvial terraces, broad-valley positions, glacial depressions, and lacustrine systems. Soils on steep gradients are more susceptible to natural erosion by over-land flow than flatter areas, possibly preventing formation of a deep soil. Landform gradient also tends to produce lateral soil water movement. This water may carry salts, oxides, suspended material, or solutes to landscape depressions. In arid environments, potential evaporation rates exceed precipitation, thereby removing the water and concentrating these salts, often producing saline or alkaline soils.

The length of time parent materials are exposed to weathering directly affects the degree of soil development. Riparian soils are commonly formed in alluvium and are typically younger than adjacent upland soils, but can be of any age. The time required for the development of a soil horizon is uniquely related to all five soil-forming factors.

SASKATCHEWAN ECOREGIONS WITHIN THE STUDY AREA

The following descriptions of Saskatchewan Prairie Ecoregions are taken from the Saskatchewan Conservation Data Centre Internet website and *The Ecoregions of Saskatchewan* (Acton and others 1998). Figure 1 illustrates the distribution of Prairie Ecoregions within the Saskatchewan Prairie Ecozone (Acton and others 1998).

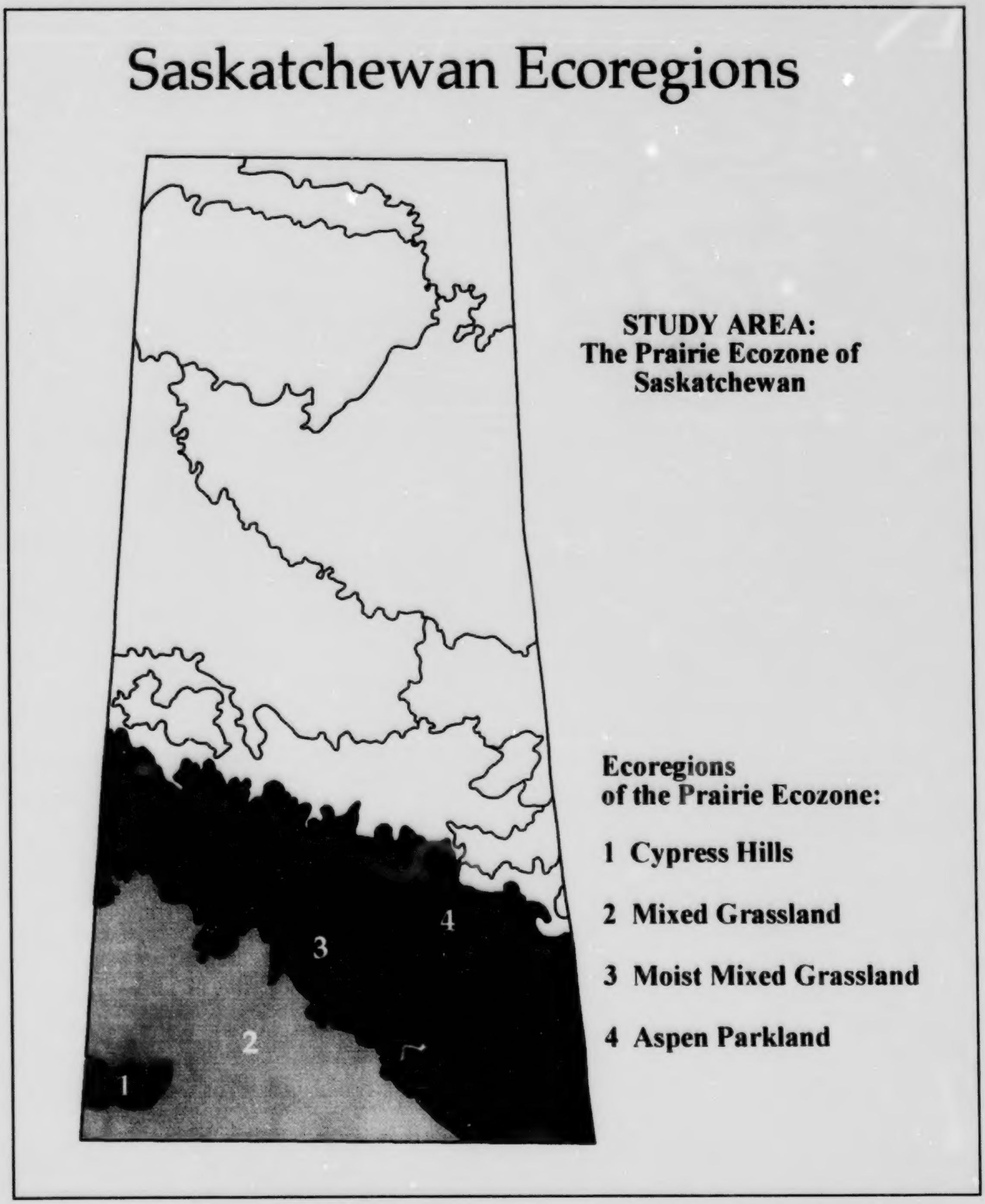
Saskatchewan Ecoregions
STUDY AREA:
The Prairie Ecozone of Saskatchewan
Ecoregions of the Prairie Ecozone:
1 Cypress Hills
2 Mixed Grassland
3 Moist Mixed Grassland
4 Aspen Parkland
1
2
3
4

Figure 1. Prairie ecoregions of Saskatchewan

Topography and Landform

Mixed Grassland Ecoregion—This ecoregion represents the driest area of the province as evidenced by the absence of native trees and scarcity of wetlands and permanent water bodies. Its diverse landscapes include level, glacial lake plains; dune-covered, sandhill areas; the hilly, pothole country along the Missouri Coteau; and the rolling expanses of native grassland and intermittent "badlands" near the United States border.

Moist Mixed Grassland Ecoregion—This ecoregion marks the northern extension of open grassland in the province, and it is closely correlated with semi-arid moisture conditions and dark brown soils. Most landscapes are comprised of glacial till, and have short, steep slopes and numerous undrained depressions or sloughs, although several large, level glacial lake plains also occur. The prairie potholes or sloughs are less common than in the Aspen Parkland.

Aspen Parkland Ecoregion—The Aspen Parkland Ecoregion comprises a broad plain that is interrupted by deep, scenic valleys and subdued hilly uplands. The primary slope of the plain is downward to the north and east, in accordance with the slope of the bedrock surface. Most of the region has a cover of glacial drift that is sufficiently thick to obscure the underlying bedrock topography; hence, striking bedrock landscapes (such as occur in the Mixed Grassland and Cypress Upland ecoregions) are lacking. Secondary slopes from the uplands to drainage systems such as the North Saskatchewan and Qu'Appelle rivers occasionally break the general northward slope of the plain.

Cypress Upland Portion of the Montane Ecoregion—There are a number of landforms in the Cypress Upland that are unique to all but the Wood Mountain area of the province. An unglaciated bedrock surface lies above 1,300 m (4264 ft) in the West Block. It comprises two nearly level plateaus separated by a broad steep valleys formed in Tertiary times. These plateau remnants are capped by quartzite gravels and cobbles that are locally cemented into conglomerate. Glacial erratics are found on bedrock that forms the long, gentle slopes at 1,100 (3,608 ft) to 1,300 m (4,264 ft) on the south side of the Cypress upland, suggesting these areas were covered with ice during glaciation.

Climate

Mixed Grassland Ecoregion—The Mixed Grassland has a semiarid climate. It is warmer and slightly drier than in the Moist Mixed Grassland and the Cypress Upland ecoregions. Within the mixed grassland, temperatures are higher on the plains of lower elevation to the north and east than on the higher plains and plateaus in the southern part of the region, but there is variability in precipitation throughout the region. The mean annual daily temperature is 4.0°C (39.0°F). The mean July temperature is 18.9° C (66.0°F), and the mean January temperature is -12.6°C (9.3°F). The mean annual precipitation is 352 mm (13.9 in), with 219 mm (8.62 in) of rainfall occurring from May to September. The summers are short but warm, with a frost-free period of 112 days and a total of 1,797 degree-days above 5°C (41.0°F).

Moist Mixed Grassland Ecoregion—The Moist Mixed Grassland Ecoregion has a subhumid continental climate. It is cooler and wetter, and consequently less arid, than in the Aspen Parkland Ecoregion to the south and west of it but warmer and slightly drier than in the Aspen Parkland Ecoregion to the north and east. Within the moist mixed grassland, temperature and precipitation are lower in the northwest than in the southeast. Temperatures are also lower at high elevations than on nearby plains. The mean annual daily temperature is 2.4 °C (36.3°F). The mean July temperature is 18.4°C (65.1°F), and the mean

January temperature is -16.7°C (1.9°F). The mean annual precipitation is 383 mm (15.1 in), with 240 mm (9.4 in) of rainfall occurring from May to September. The summers are short and warm, with a frost-free period of 110 days and a total of 1,663 degree-days above 5°C (41.0°F).

Aspen Parkland Ecoregion—The Aspen Parkland Ecoregion has a humid continental climate. It is cooler and wetter, and, consequently, less arid than in the boreal ecoregions to the north and east, Within the Aspen Parkland, temperature and precipitation ate lower in the northwest than in the southeast. Temperatures are also lower at high elevations than on nearby plains. The mean annual daily temperature is 1.4°C (34.5°F). The mean July temperature is 18.0°C (64.0°F), and the mean January temperature is -18.9°C (-2.0°F). The mean annual precipitation is 420 mm (17.0 in), with 262 mm (10.3 in) of rainfall occurring from May to September. The summers are short and warm, with a frost-free period of 106 days and a total of 1,584 degree-days above 5°C (41.0°F).

Cypress Upland and Wood Mountain Area Montane Ecoregions—The Cypress Upland Ecoregion has a subhumid to humid continental climate that is cooler and more moist than the surrounding Mixed Grassland Ecoregion. The mean annual daily temperature is 2.7°C (36.9°F). The mean July temperature is 16.0°C (61.0°F), and the mean January temperature is -12.1°C (10.2°F). The mean annual precipitation is 450 mm (18.0 in), with 244 mm (9.6 in) of rainfall occurring from May to September. The summers are short and warm, with a frost-free period of 52 days and a total of 1,288 degree-days above 5°C (41.0°F).

Soils

Mixed Grassland Ecoregion—Brown Chernozemic soils prevail throughout this ecoregion in response to the relatively small additions of organic matter in these mixed grasslands and rapid rates of decomposition in the warmer part of the mixed-grass prairie. Soils tend to be thin and lower in organic matter on upper slopes, becoming progressively thicker and higher in organic matter on mid and lower slope positions on steeply sloping topography, where wheat grasses, speargrasses, and other grasses that typify the moist mixed grassland prevail.

Moist Mixed Grassland Ecoregion—Dark Brown Chernozemic soils prevail throughout this ecoregion in response to the relatively large additions of organic matter in these mixed grasslands and slower rates of decomposition in these cooler part of the mixed-grass prairie. Soils tend to be thin and lower in organic matter on upperslopes, becoming progressively thicker and higher in organic matter on mid and lower slopes, in response to an increased supply of soil moisture and plant growth. Brown soils occur on prominent south-facing local and regional slopes where conditions that are more arid result in reduced growth. Black soils occur on prominent north-facing slopes and in lower-slope positions on steeply sloping topography, where fescues and other grasses that typify the aspen parkland prevail.

Aspen Parkland Ecoregion—Black Chernozemic soils prevail throughout this ecoregion in response to large additions of organic matter in these fescue grasslands and slower rates of decomposition in this cooler portion of the Prairie Ecozone. Soils tend to be thin and lower in organic matter on upperslopes, becoming progressively thicker and higher in organic matter on mid and lower slopes, in response to an increased supply of soil moisture and plant growth. Dark Brown soils occur on prominent south-facing local and regional slopes where conditions that are more arid result in reduced growth. Dark Gray Chernozemic and Dark gray and Gray Luvisolic soils occur at higher elevation and on prominent north-facing slopes, where grassland vegetation has been displace by trembling aspen.

Cypress Uplands Portion of the Montane Ecoregions—The south-facing slopes of the Cypress Uplands are dominated by Dark Brown soils under grassland vegetation, although Brown soils occur at lower elevations. Black soils are common on unglaciated fescue prairie-logepole pine covered plateaus that extend from the Centre Block to the Alberta border and under mixedgrass prairie in the East and Centre blocks. Dark Gray and Gray Luvisolic soils are found under white spruce and aspen forests on north-facing slopes.

DEVELOPMENT OF THE ECOLOGICAL SITE CLASSIFICATION

Background

The Riparian and Wetland Research Program (RWRP) was contracted in 1998 to develop a riparian and wetland ecological site classification following the methods and format used for the *Classification and Management of Montana's Riparian and Wetland Sites* (Hansen and others 1995). In order to shorten the time necessary to obtain a large enough working set of stand data, we incorporated portions of the data set used for Montana. The rationale for this decision is that the plant species and community distributions are not restricted by the international boundary, i.e., that most of the communities occurring in southern Saskatchewan also are found in Montana. RWRP has undertaken concurrently in southern Alberta a similar project to classify ecological sites, for which additional stands of many of the same site types were sampled. We recognize that we are working with ecologic gradients, such as latitude and elevation that are reflected in floristic differences as one goes both north and east. For this reason, we collected as much stand data as possible within the Saskatchewan study area over the time span of this project to include with data from outside the study area.

Field Methods

The database for development of the Saskatchewan classification consists of 1,517 sample plots. The following data were analysed:

1. Data collected in Saskatchewan.
2. Data collected in Alberta.
3. Data collected for the Montana document that was applicable to the study area.

Stand selection was based on "subjective sampling without preconceived bias" as described by Mueller-Dombois and Ellenberg (1974). Plots were selected to reflect the apparent range of environmental and successional conditions and the homogeneity of the vegetation, rather than any eventual placement of the stand within a classification system. In practice, field observers chose stands of vegetation to sample that they saw as dominated by particular species occurring repeatedly across the study area.

For sampling herbaceous communities (graminoids and forbs) we used plots 5 m (16.4 ft) by 10 m (32.8 ft), total area of 50 m^2 (538 ft^2) (Mattson 1984, Platts and others 1987, Tuhy and Jensen 1982, Youngblood and others 1985a, Youngblood and others 1985b). For long stringers of these communities, plot width was reduced and length was increased to maintain a constant plot size of 50 m^2 (538 ft^2). This plot size was considered adequate to include most species of a community, yet small enough for the sampler to see the entire plot. Each plot was located within a stand at least twice the area of the plot to avoid sampling ecotones between communities. When sampling communities dominated by trees or tall shrubs, a

375 m^2 (35.8 ft radius) circular plot was used. Again, for communities in long stringers the plot shape was adjusted.

Canopy cover (Daubenmire 1959) by species is ocularly estimated within each plot. Plants not identified in the field are collected for identification later. Data regarding successional relationships and adjacent communities are also collected. Data regarding physical site features are collected for each plot and include soil morphology, litter/duff accumulation, geomorphology, human modifications, elevation, and natural and human-caused disturbances.

Office Methods

Development of the Saskatchewan riparian and wetland site classification followed the general procedures and timetable outlined below.

1. Specimens of plants are identified in the field, the office, or The University of Montana herbarium.
2. The stand data is entered into a database for analysis, using modules designed to sort plot data into stand/species tables for use in the stepwise successive approximations to develop the classification (Pfister and Arno 1980).
3. Preliminary association tables are created using plot species and canopy cover values. Stands are then rearranged several times to group them into sets with the greatest vegetation similarities. Plot-to-plot similarity relations, plot-to-set similarity relations, and set-to-set similarity relations were analysed using a modified Sorensen's Index. The final placement of each sample plot into a set is based on both floristic and environmental relationships.
4. Average canopy cover, canopy cover range, and constancy tables are created for each group. Average canopy cover is the average value of cover of a species in those plots where it was recorded. Canopy cover range is the lowest and highest canopy cover value recorded for a species. Constancy is the percentage of plots with the species present (sometimes called "presence value"). If constancy is less than 100 percent, then the lower value of the range is zero. To fully understand the distribution and importance of a species in a "type," the reader must consider both its average canopy cover and constancy together.
5. A dichotomous key to the preliminary types is developed based on the presence or abundance of diagnostic plant species that indicate the presence of certain environmental conditions (indicator species). The key was then applied to all plots, and necessary revisions are made to accommodate variations in the data.
6. A description is prepared for each habitat type and community type, with a general discussion of vegetation, physical site features, and management implications included.
7. The draft classification for the Saskatchewan Prairie Ecozone and parts of adjacent subregions was provided to users for interim use and field testing in 1999. Revisions were then incorporated into this second approximation using comment from reviewers and some additional data collected during the year 2000 field season in Alberta.

A number of riparian habitat types and community types have been defined by various other authors in the general region of the Northern Great Plains and surrounding areas. These authors include the following: Lawrence and Romo (1994) and Michalsky and others (1994) for localized areas within the southern Saskatchewan grasslands; Adams and others (1997) for the Suffield Canadian Forces Base, Alberta; Pfister and others (1977), Mueggler and Stewart (1980), and Hansen and Hoffman (1988) for Montana and adjacent states; Cooper and others (1991) for northern Idaho; Mueggler (1988) for Idaho and Wyoming; Steele and others (1983) for eastern Idaho and western Wyoming; and Youngblood and others

(1985b) for eastern Idaho-western Wyoming. The authors of this publication attempted to adopt previously defined types whenever possible. However, many of the types described in these other classifications are not equivalent or did not match our descriptions. Therefore, we selected from those works the riparian habitat types and community types that best fit the ecological conditions observed in Saskatchewan, or we defined new types.

Taxonomic Considerations

Taxonomic nomenclature follows Moss (1959, as revised by Packer 1983).

Cottonwoods—Occasionally, some species present problems in positive identification. Taxonomic workers in North America dealing with the *Populus* genus have tended to be conservative in holding to broader species concepts in recognition of a broader range of variation within a species. Although cottonwood hybridisation is common, the hybrid zones are generally geographically narrow (Stettler and others 1996). Natural F_1 hybrids between particular combinations of parental species may have consistent and recognizable morphologies and definite geographical ranges, but their coherence disappears with successive generations (Eckenwalder 1996). For these reasons we have not treated any of the suspected hybrids separately at this time, but have included them with the morphologically and spatially closest parent species.

Ecological Equivalents

We have grouped several species together in the key due to similarities in morphology, environmental conditions, and management concerns. Stands comprised of the following combinations of species were grouped together:

1. The *Polygonum coccinium* (water smartweed) community type includes all combinations of *Polygonum coccinium* (water smartweed) and *Polygonum coccineum* (water smartweed).
2. The *Eleocharis palustris* (creeping spike-rush) habitat type includes all combinations of *Eleocharis palustris* (creeping spike-rush) and *Eleocharis acicularis* (needle spike-rush).
3. The *Scirpus acutus* (great bulrush) habitat type includes all combinations of *Scirpus acutus* (great bulrush) and *Scirpus validus* (common great bulrush).
4. The *Typha latifolia* (common cattail) habitat type includes all combinations of *Typha latifolia* (common cattail) and *Typha angustifolia* (narrow-leaved cattail).
5. *Crataegus rotundifolia* (round-leaved hawthorn) community type includes all combinations of *Crataegus rotundifolia* (round-leaved hawthorn) and *Crataegus douglasii* (Douglas hawthorn).
6. *Rosa woodsii* (common wild rose) community type includes all combinations of *Rosa woodsii* (common wild rose) and *Rosa acicularis* (prickly rose).
7. The *Agrostis stolonifera* (redtop) community type includes all combinations of *Agrostis stolonifera* (redtop) and *Agrostis scabra* (rough hair grass).

Ecological Terms and Concepts

The following classification of climax vegetation was first proposed by Tansley (1935) and later modified by Daubenmire (1952). A ***climax community*** is a final or steady state plant community which is self-perpetuating and in dynamic equilibrium with its environment. ***Climatic climax*** vegetation develops on normal topography with fairly deep loamy soil. Where topography or soil exerts sufficient influence to produce a self-perpetuating, steady state of vegetation distinct from the climatic climax, the terms ***topographic climax*** or ***edaphic climax*** respectively are used. Where special topographic conditions also favor the development of edaphic conditions distinct from the normal, and the climax vegetation is distinct from the climatic climax, the term ***topoedaphic climax*** is used. Where recurring disturbances, such as grazing or fire, exert the predominant influence in maintaining the structure and composition of the steady-state vegetation, the term ***disclimax*** is used. A ***zootic climax*** is stable vegetation, which is distinct because of heavy use by animals. ***Fire climax*** is apparently stable vegetation, which is distinctive because of periodic burning. ***Disclimaxes, such as the zootic climax or fire climax, are not the basis for recognizing habitat types.*** A ***seral community*** is a vegetation community that has theoretically not attained a steady state; seral communities successively occupy and replace others of a particular environment over time.

The following concepts and terminology are consistent with usage proposed by Daubenmire (1952, 1968, 1978) and have been used in numerous studies of vegetation-based ecological site classification (habitat types) (Daubenmire 1952, Daubenmire and Daubenmire 1968, Daubenmire 1970, Hoffman and Alexander 1980, Hoffman and Alexander 1983, Hoffman and Alexander 1987, Pfister and others 1977, Jorgensen 1979, Mueggler and Stewart 1980, Pfister and Arno 1980, Steele and others 1981, Hironaka and others 1983, Hanks and others 1983, Cooper 1981, Cooper and Pfister 1985, Hansen and others 1984, Hansen and Hoffman 1988, Hansen and others 1995, Youngblood and Mauk 1985, DeVelice and others 1986, Cooper and others 1991, Kovalchik 1987, Tiedeman and others 1987). For a review of vegetation-based ecological site classifications (habitat types), see Ferguson and others (1989) and Pfister (1989).

A ***habitat type*** is defined as the land area that supports, or has the potential of supporting, the same climax vegetation type (association). A ***phase*** is a finer subdivision of a habitat type representing a minor variation in climax vegetation. Each habitat type represents a relatively narrow segment of environmental variation having a certain potential for vegetation development. Although any given habitat type may support a wide variety of disturbance-caused or seral vegetation, the ultimate product of vegetational succession anywhere within that habitat type will be a similar plant community. Therefore, the habitat type is a vegetation-based ecological site classification that uses the plant community as an indicator of integrated environmental factors as they affect species reproduction and plant community development. Changes in site conditions such as drying and filling of potholes or sufficient deposition of alluvium on floodplains to create a drier site over time can change the habitat type. Cyclical changes that do not change long-term site conditions will remain the same habitat type. Habitat types have been used extensively to classify grasslands, shrublands, woodlands, and forests throughout the western United States and to some areas in the central and eastern United States.

The term ***plant association*** is used to group together all those stands of climax vegetation, which occur in environments so similar that there is much floristic similarity throughout all layers of the vegetation. For our work, we have chosen to follow the lead of Kovalchik (1987) in the development of a vegetation based ecological site classification for riparian and wetland areas. Kovalchik (1987) uses the term ***riparian association*** as a vegetation type representing the latest successional stage attainable on a specific hydrologically influenced surface. Because the riparian association is the end result of plant succession, it reflects the most meaningful integration of environmental factors affecting vegetation. (The association, or climax plant community type, is essentially equivalent to "potential natural community [type]," and climax vegetation is essentially equivalent to "potential natural vegetation" for purposes of developing a vegetation-based site classification system.)

Naming of the plant association follows the frequently used system of a binomial set with the dominant overstory species separated from the dominant or most diagnostic indicator of the undergrowth union by a slash. For example, numerous stands of the *Salix petiolaris/Carex atherodes* (basket willow/awned sedge) association occur. The units of land on which these occur (currently or potentially) represent the *Salix petiolaris/Carex atherodes* (basket willow/awned sedge) habitat type. Some riparian and wetland climax communities consist of only a single layer of vegetation; we consider this the overstory and ignore all references to additional layers (e.g., the *Carex atherodes* [awned sedge] habitat type).

In addition to habitat types, several major seral plant communities that are stable for time frames relevant to land management decisions have been described. These are referred to as ***community types.*** A ***community type*** is an aggregation of all plant communities distinguished by floristic and structural similarities in both overstory and undergrowth layers. Examples are the *Populus deltoides/Cornus stolonifera* (Plains cottonwood/red-osier dogwood) community type and the *Salix exigua* (sandbar willow) community type. ***In this classification, the term community type only represents seral or disclimax communities because climax community types are defined as riparian associations.***

Our goal is to provide understanding of plant communities in relation to factors of time, physical environment (site), and treatment; and to communicate that understanding through a taxonomic classification system. The concepts and terminology are illustrated in Figure 2 for further clarification. The upper cell is the ***plant association*** (climax vegetation type or latest successional stage attainable). After riparian associations are identified and defined, a taxonomic key is written to identify the column (physical environment or site) that represents the ***habitat type.*** This key allows identification of the habitat type in most stages of successional development. In some instances, the successional relationships are fairly evident. For example, community types A-2, A-3, and A-4 represent specific and clearly identified successional stages within association A. On the other hand, community type B/C-2 represents a grazing disclimax that extends over two or more habitat types that may currently provide insufficient evidence to distinguish the specific habitat type (column). In association D, our present knowledge base only allows us to identify one seral stage, such as community type D-2. Finally, riparian association E represents the situation in which the time frame of the successional pathway is brief, and the latest successional stage (riparian plant association) is obtained after only a few years. Examples of association E include *Carex atherodes* (awned sedge) and *Typha latifolia* (common cattail) where the pioneering species is a very aggressive plant that also represents the potential climax vegetation for the site.

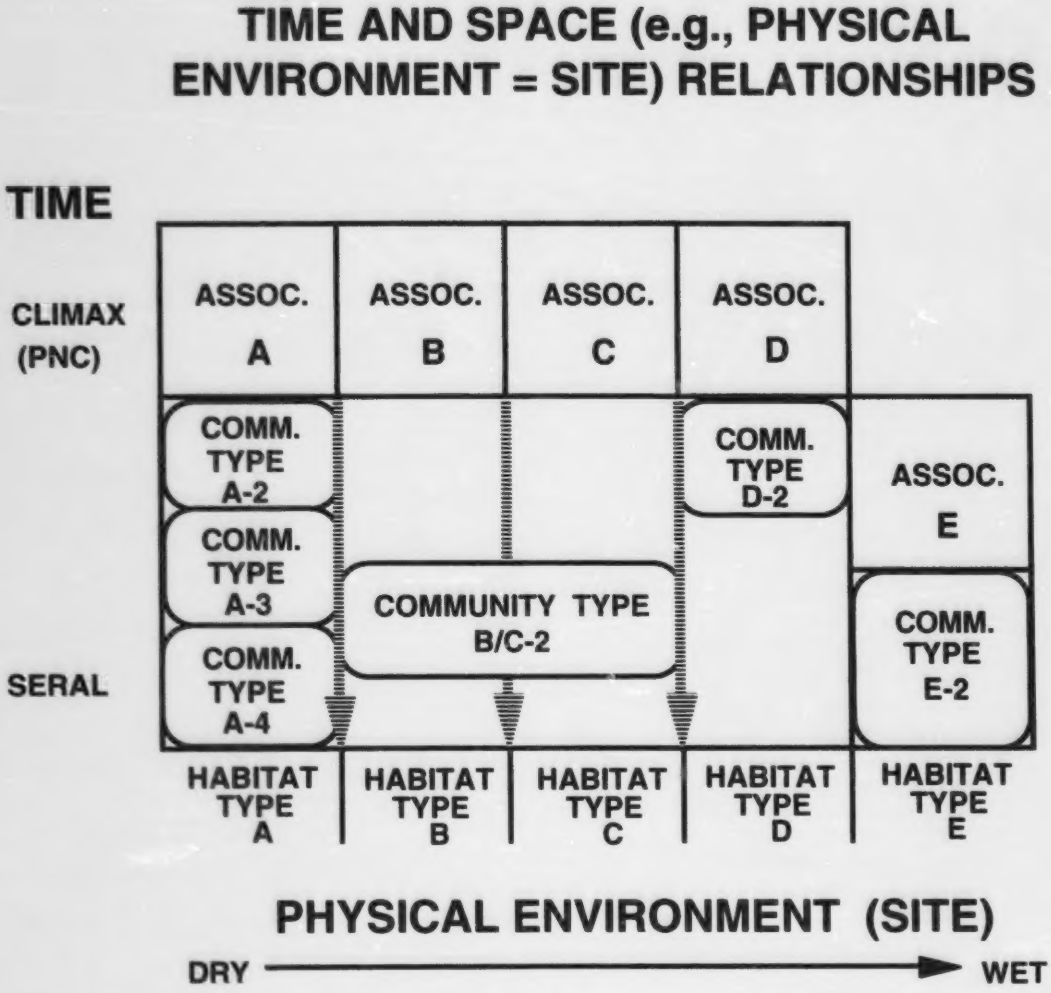
TIME AND SPACE (e.g., PHYSICAL ENVIRONMENT = SITE) RELATIONSHIPS
TIME
CLIMAX (PNC)
SERAL
ASSOC. A
ASSOC. B
ASSOC. C
ASSOC. D
ASSOC. E
COMM. TYPE A-2
COMM. TYPE A-3
COMM. TYPE A-4
COMMUNITY TYPE B/C-2
COMM. TYPE D-2
COMM. TYPE E-2
HABITAT TYPE A
HABITAT TYPE B
HABITAT TYPE C
HABITAT TYPE D
HABITAT TYPE E
PHYSICAL ENVIRONMENT (SITE)
DRY
WET

Figure 2. Illustration of the terminology as it relates to time and space (e.g. physical environment = site) for riparian and wetland sites

The time frame for site-successional processes varies greatly, depending upon the type, location, and origin of the riparian and wetland area. As an example, beaver ponds may silt-in within a few years or hundreds of years. In contrast, analysis of a few mountain meadows in Colorado has shown them to be stable for the last 6,900 years (Windell and others 1986). In the Madison Range, Montana, Patten (1963) considered that the vegetation was still adjusting to the post-Pleistocene climate, but that vegetation patterns, including mountain meadows, are relatively stable.

The long-term product of vegetative succession is the climax or steady-state community. Theoretically, this community, free of major disturbance, is self-perpetuating and represents a meaningful integration of its total environment. It is from this assumption that climax vegetation is useful in the recognition of habitat types.

The climax plant community (plant association), as the theoretical end result of succession, is an expression of the biotic potential of that site. Each habitat type is a relatively narrow segment of environmental variation and is defined by a certain potential for vegetational development. Although one habitat type may support a variety of disturbance-caused (seral) plant communities, the potential product of vegetational succession anywhere within one habitat type will be a similar climax community. Therefore, the habitat type classification uses the plant community as an integrated expression of the environmental factors affecting species reproduction and plant community development.

Some ecologists dispute the existence of successional end points in the form of climax communities. This argument has developed primarily from the study of global climate change, which indicates that plant communities progress along successional pathways, but are continually adapting to changes in climate and natural disturbance and thus never truly reach an end point in succession. This argument may have particular relevance to the highly dynamic environment of the riparian zone where hydrological influences are often more dramatic and may fluctuate significantly both seasonally and annually. These fluctuations and associated natural disturbances may result in an ever-changing environment, and make it difficult to predict the potential vegetation community. Nevertheless, current knowledge of successional pathways, and of the temporal persistence of major seral plant communities reflecting current site differences, is still relevant to resource management.

LIST OF TYPES

Geographic Distribution of Types

Table 1 is a list of habitat types and community types described in southern Saskatchewan showing the number of stands sampled of each type in Saskatchewan, Alberta, and Montana. The relative distribution of sampling may approximate the general distribution of that type on the landscape, but not in all cases. For example, although all stands of the *Picea glauca/Cornus stolonifera* (white spruce/red-osier dogwood) habitat type sampled were in Alberta, this type does occur in Saskatchewan. The reader should refer to Table 2 for information on occurrence distribution of each type within the study area.

Table 1. Distribution of stands sampled of each riparian and wetland habitat type (h.t.) and community type (c.t.) among Saskatchewan, Alberta, and Montana

TABLE 1.	**Number of Stands Sampled**			
Type	**Total**	**Sask.**	**Alberta**	**Mont.**
Coniferous Tree Types				
Picea glauca/Cornus stolonifera h.t. (white spruce/red-osier dogwood) h.t.	11	0	11	0
Deciduous Tree Types				
Acer negundo/Prunus virginiana h.t. (Manitoba maple/choke cherry) h.t.	35	18	3	14
Fraxinus pennsylvanica/Prunus virginiana h.t. (green ash/choke cherry) h.t.	86	10	2	74
Populus balsamifera/Cornus stolonifera c.t. (balsam poplar/red-osier dogwood) c.t.	34	5	25	4
*Populus balsamifera/*Herbaceous c.t. (balsam poplar/red-osier dogwood) c.t.	14	2	7	5
*Populus balsamifera/*Recent Alluvial Bar c.t. (balsam poplar/Recent Alluvial Bar) c.t.	9	1	3	5
Populus balsamifera/Symphoricarpos occidentalis c.t. (balsam poplar/buckbrush) c.t.	21	1	9	11
Populus deltoides/Cornus stolonifera c.t. (plains cottonwood/red-osier dogwood) c.t.	17	1	10	6
*Populus deltoides/*Herbaceous c.t. (plains cottonwood/Herbaceous) c.t.	12	2	5	5
*Populus deltoides/*Recent Alluvial Bar c.t. (plains cottonwood/Recent Alluvial Bar) c.t.	34	1	8	25
Populus deltoides/Symphoricarpos occidentalis c.t. (plains cottonwood/buckbrush) c.t.	25	0	6	19
Populus tremuloides/Cornus stolonifera h.t. (aspen/red-osier dogwood) c.t.	21	4	15	2
*Populus tremuloides/*Herbaceous c.t. (aspen/Herbaceous) c.t.	11	1	8	2
Populus tremuloides/Symphoricarpos occidentalis c.t. (aspen/buckbrush) c.t.	9	2	5	2
Willow Shrub Types				
Salix amygdaloides c.t. (peach-leaved willow) c.t.	26	2	5	19
Salix bebbiana/Carex atherodes h.t. (beaked willow/awned sedge) h.t.	14	2	10	2
Salix bebbiana/Cornus stolonifera h.t. (beaked willow/red-osier dogwood) h.t.	25	12	9	4
Salix bebbiana c.t. (beaked willow) c.t.	27	1	21	5
Salix exigua c.t. (sandbar willow) c.t.	70	15	13	42
Salix lutea/Cornus stolonifera h.t. (yellow willow/red-osier dogwood) h.t.	23	5	17	1
Salix lutea c.t. (yellow willow) c.t.	10	0	10	0
Salix petiolaris/Carex atherodes h.t. (basket willow/awned sedge) h.t.	12	7	5	0
Salix petiolaris/Cornus stolonifera h.t. (basket willow/red-osier dogwood) h.t.	10	5	5	0

TABLE 1.	**Number of Stands Sampled**			
Type	**Total**	**Sask.**	**Alberta**	**Mont.**
Salix petiolaris c.t. (basket willow) c.t.	5	3	2	0
Non-Willow Shrub Types				
Amelanchier alnifolia c.t. (Saskatoon) c.t.	9	6	3	0
Artemisia cana/Agropyron smithii h.t. (silver sagebrush/western wheat grass) h.t.	43	1	8	34
Betula occidentalis c.t. (water birch) c.t.	22	5	10	7
Crataegus rotundifolia c.t. (round-leaved hawthorn) c.t.	14	7	2	5
Elaeagnus commutata c.t. (silverberry) c.t.	20	8	12	0
Prunus virginiana c.t. (choke cherry) c.t.	25	10	9	6
Rosa woodsii c.t. (common wild rose) c.t.	15	1	6	8
Sarcobatus vermiculatus/Agropyron smithii h.t. (greasewood/western wheat grass) h.t.	14	3	2	9
Shepherdia argentea c.t. (thorny buffaloberry) c.t.	28	7	9	12
Symphoricarpos occidentalis c.t. (buckbrush) c.t.	29	8	9	12
Sedge Types				
Carex aquatilis h.t. (water sedge) h.t.	24	4	12	8
Carex atherodes h.t. (awned sedge) h.t.	42	10	22	10
Carex lanuginosa h.t. (woolly sedge) h.t.	14	1	5	8
Non-Sedge Types				
Agropyron smithii h.t. (western wheat grass) h.t.	34	9	9	16
Bromus inermis c.t. (awnless brome) c.t.	7	5	2	0
Calamagrostis stricta h.t. (narrow reed grass) h.t.	8	1	5	2
Deschampsia cespitosa h.t. (tufted hairgrass) h.t.	14	6	7	1
Distichlis stricta h.t. (saltgrass) h.t.	25	7	4	14
Eleocharis palustris h.t. (creeping spike-rush) h.t.	31	13	6	12
Hordeum jubatum c.t. (foxtail barley) c.t.	17	7	5	5
Juncus balticus c.t. (wire rush) c.t.	14	1	7	6
Phalaris arundinacea h.t. (reed canary grass) h.t.	31	13	5	13
Phragmites australis h.t. (common reed) h.t.	12	6	1	5
Poa pratensis c.t. (Kentucky bluegrass) c.t.	8	1	2	5

TABLE 1.	Number of Stands Sampled			
Type	Total	Sask.	Alberta	Mont.
Polygonum coccineum c.t. (water smartweed) c.t.	11	4	2	5
Puccinellia nuttalliana h.t. (Nuttall's salt-meadow grass) h.t.	22	6	8	8
Salicornia europaea h.t. (samphire) c.t.	14	7	3	4
Scirpus acutus h.t. (great bulrush) h.t.	41	12	16	13
Scirpus paludosus h.t. (prairie bulrush) h.t.	23	11	7	5
Scirpus pungens h.t. (three-square bulrush) h.t.	33	10	11	12
Scolochloa festucacea h.t. (spangletop) h.t.	13	12	1	0
Typha latifolia h.t. (common cattail) h.t.	53	10	12	31

Table 2 lists the relative abundance of each habitat type and community type in the four ecoregions of southern Saskatchewan. This information is not based solely on the locations of stands sampled, but also on notes of vegetation distribution taken during extensive travels throughout the study area.

The meaning of the terms used for relative abundance: ***major***—occupies extensive acreages in a least some portion of the riparian or wetland zone; ***minor***—seldom occupies large acreages but may be common within the riparian or wetland zone; ***incidental***—only rarely occurs in the riparian or wetland zones of that ecoregion. A "dash" indicates that the type is essentially absent from that particular region of the province.

For example, although no stands were sampled in Saskatchewan of the *Picea glauca/Cornus stolonifera* (white spruce/red-osier dogwood) habitat type, stands of it were observed on lands inaccessible to sampling entry. These were located on higher slopes of the Cypress Hills Upland, along the steep slopes of the major river valleys (i.e., the North Saskatchewan River and the Battle River), and along the northern edge of the Aspen Parkland Ecoregion.

Table 2. Relative abundance and distribution of riparian and wetland habitat types (h.t.) and community types (c.t.) among the ecoregions of southern Saskatchewan

TABLE 2.	Subregion Groups			
Type	Cypress Upland	Mixed Grassland	Moist Mixed Grassland	Aspen Parkland
Coniferous Tree Types				
Picea glauca/Cornus stolonifera h.t. (white spruce/red-osier dogwood) h.t.	Minor	—	Incidental	Incidental
Deciduous Tree Types				
Acer negundo/Prunus virginiana h.t. (Manitoba maple/choke cherry) h.t.	—	Minor	Minor	Incidental

TABLE 2.	**Subregion Groups**			
Type	**Cypress Upland**	**Mixed Grassland**	**Moist Mixed Grassland**	**Aspen Parkland**
Fraxinus pennsylvanica/Prunus virginiana h.t. (green ash/choke cherry) h.t.	—	Minor	Minor	—
Populus balsamifera/Cornus stolonifera c.t. (balsam poplar/red-osier dogwood) c.t.	Incidental	Incidental	Minor	Minor
Populus balsamifera/Herbaceous c.t. (balsam poplar/red-osier dogwood) c.t.	Incidental	Incidental	Minor	Minor
Populus balsamifera/Recent Alluvial Bar c.t. (balsam poplar/Recent Alluvial Bar) c.t.	Incidental	Incidental	Minor	Minor
Populus balsamifera/Symphoricarpos occidentalis c.t. (balsam poplar/buckbrush) c.t.	Incidental	Incidental	Minor	Minor
Populus deltoides/Cornus stolonifera c.t. (plains cottonwood/red-osier dogwood) c.t.	—	Minor	Minor	—
Populus deltoides/Herbaceous c.t. (plains cottonwood/Herbaceous) c.t.	—	Minor	Minor	—
Populus deltoides/Recent Alluvial Bar c.t. (plains cottonwood/Recent Alluvial Bar) c.t.	—	Minor	Minor	—
Populus deltoides/Symphoricarpos occidentalis c.t. (plains cottonwood/buckbrush) c.t.	—	Minor	Minor	—
Populus tremuloides/Cornus stolonifera h.t. (aspen/red-osier dogwood) c.t.	Minor	Minor	Minor	Major
Populus tremuloides/Herbaceous c.t. (aspen/Herbaceous) c.t.	Minor	Minor	Minor	Major
Populus tremuloides/Symphoricarpos occidentalis c.t. (aspen/buckbrush) c.t.	Minor	Minor	Minor	Major
Willow Shrub Types				
Salix amygdaloides c.t. (peach-leaved willow) c.t.	—	Incidental	Incidental	—
Salix bebbiana/Carex atherodes h.t. (beaked willow/awned sedge) h.t.	Incidental	Minor	Minor	Minor
Salix bebbiana/Cornus stolonifera h.t. (beaked willow/red-osier dogwood) h.t.	Incidental	Minor	Minor	Minor
Salix bebbiana c.t. (beaked willow) c.t.	Incidental	Minor	Minor	Minor
Salix exigua c.t. (sandbar willow) c.t.	Minor	Major	Major	Minor
Salix lutea/Cornus stolonifera h.t. (yellow willow/red-osier dogwood) h.t.	—	Minor	Minor	—
Salix lutea c.t. (yellow willow) c.t.	—	Minor	Minor	—
Salix petiolaris/Carex atherodes h.t. (basket willow/awned sedge) h.t.	—	Incidental	Incidental	Major
Salix petiolaris/Cornus stolonifera h.t. (basket willow/red-osier dogwood) h.t.	—	Incidental	Incidental	Minor
Salix petiolaris c.t. (basket willow) c.t.	—	Incidental	Incidental	Major
Non-Willow Shrub Types				
Amelanchier alnifolia c.t. (Saskatoon) c.t.	Incidental	Incidental	Incidental	—
Artemisia cana/Agropyron smithii h.t. (silver sagebrush/western wheat grass) h.t.	—	Minor	—	—
Betula occidentalis c.t. (water birch) c.t.	—	Incidental	Incidental	Incidental

TABLE 2.	Subregion Groups			
Type	**Cypress Upland**	**Mixed Grassland**	**Moist Mixed Grassland**	**Aspen Parkland**
Crataegus rotundifolia c.t. (round-leaved hawthorn) c.t.	Incidental	Incidental	Minor	Incidental
Elaeagnus commutata c.t. (silverberry) c.t.	Minor	Major	Major	Minor
Prunus virginiana c.t. (choke cherry) c.t.	Incidental	Minor	Minor	Minor
Rosa woodsii c.t. (common wild rose) c.t.	Incidental	Minor	Minor	Incidental
Sarcobatus vermiculatus/Agropyron smithii h.t. (greasewood/western wheat grass) h.t.	—	Incidental	—	—
Shepherdia argentea c.t. (thorny buffaloberry) c.t.	—	Minor	—	—
Symphoricarpos occidentalis c.t. (buckbrush) c.t.	Minor	Major	Major	Minor
Sedge Types				
Carex aquatilis h.t. (water sedge) h.t.	Incidental	Incidental	Incidental	Minor
Carex atherodes h.t. (awned sedge) h.t.	Minor	Minor	Major	Major
Carex lanuginosa h.t. (woolly sedge) h.t.	Incidental	Incidental	Incidental	—
Non-Sedge Types				
Agropyron smithii h.t. (western wheat grass) h.t.	—	Minor	Incidental	—
Bromus inermis c.t. (awnless brome) c.t.	Incidental	Minor	Minor	Minor
Calamagrostis stricta h.t. (narrow reed grass) h.t.	—	Incidental	Incidental	Incidental
Deschampsia cespitosa h.t. (tufted hairgrass) h.t.	—	Minor	Minor	Minor
Distichlis stricta h.t. (saltgrass) h.t.	—	Minor	—	—
Eleocharis palustris h.t. (creeping spike-rush) h.t.	Incidental	Minor	Minor	Incidental
Hordeum jubatum c.t. (foxtail barley) c.t.	—	Minor	Minor	Minor
Juncus balticus c.t. (wire rush) c.t.	Incidental	Minor	Incidental	Incidental
Phalaris arundinacea h.t. (reed canary grass) h.t.	Incidental	Minor	Minor	Minor
Phragmites australis h.t. (common reed) h.t.	—	—	Incidental	Incidental
Poa pratensis c.t. (Kentucky bluegrass) c.t.	—	Incidental	Incidental	Incidental
Polygonum coccineum c.t. (water smartweed) c.t.	—	Minor	Minor	Minor
Puccinellia nuttalliana h.t. (Nuttall's salt-meadow grass) h.t.	—	Minor	Minor	—
Salicornia europaea h.t. (samphire) c.t.	—	Minor	Minor	—
Scirpus acutus h.t. (great bulrush) h.t.	Incidental	Major	Major	Major

TABLE 2.	Subregion Groups			
Type	**Cypress Upland**	**Mixed Grassland**	**Moist Mixed Grassland**	**Aspen Parkland**
Scirpus paludosus h.t. (prairie bulrush) h.t.	—	Minor	Minor	Incidental
Scirpus pungens h.t. (three-square bulrush) h.t.	—	Minor	Minor	Incidental
Scolochloa festucacea h.t. (spangletop) h.t.	—	Minor	Minor	—
Typha latifolia h.t. (common cattail) h.t.	Minor	Major	Major	Major

USE OF THE CLASSIFICATION

Management Interpretations

Habitat type classifications provide a relatively permanent and ecologically-based system of land stratification in terms of vegetational potential (Daubenmire 1976). As the habitat type is the basic unit in classifying land units (or sites) based on their biotic potential, it emphasizes similarities and differences in ecosystems, which carry implications for a variety of land management objectives (Daubenmire 1984). Some practical uses of a habitat type classification include the following:

1)	predicting livestock and wildlife forage production;
2)	evaluating wildlife habitat;
3)	developing a natural resource inventory;
4)	landtype mapping;
5)	predicting timber production;
6)	evaluating species selection for site rehabilitation;
7)	developing best management practices;
8)	predicting growth rates of trees and shrubs;
9)	predicting susceptibility of trees and shrubs to insects and disease;
10)	predicting depth of soil moisture penetration;
11)	assessing potential for forage production after fire;
12)	planning effective soil management;
13)	predicting impacts of recreational uses;
14)	selecting natural areas for preservation;
15)	inventorying downed woody fuels on the forest floor; and
16)	predicting successional trends following disturbance.

In addition, habitat types offer a basis of comparison and evaluation in the design and implementation of field experiments in ecology or applied natural resource disciplines.

There are typically three misconceptions about the use of the habitat type classification system: 1) An abundance of climax vegetation is present on the current landscape; 2) natural resource managers need to manage solely for climax vegetation; and 3) the habitat type classification system requires climax or near-climax vegetation.

With regard to the first two misconceptions, the opposite is actually true. In the first case, a very high percentage of our landscape reflects some degree of disturbance resulting in domination by various seral stages. In the second case, management strategies often favor seral species, regardless of the habitat type of a site. Regarding the third misconception, comparing the relative reproductive success of the present plant species with known successional patterns generally allows accurate identification of the habitat type. In general, succession is more rapid for undergrowth species, thereby allowing insight into the habitat type identity on the site. Where stands are severely disturbed, are in an early seral stage, or have a closed canopy resulting in a depauperate understory, comparison of the stand with adjacent stands on similar physical sites can assist in correct habitat type identification.

Habitat type classification systems are useful to land and resource managers by providing the following tools:

1) a permanent and ecologically based system of site classification that is referenced to vegetation potential (Daubenmire 1976);
2) a vegetational classification for near-climax to climax communities;
3) a way in which successional stages can be identified and described, thereby increasing our knowledge and predictability of the landscape; and
4) a basis for making predictions about various management decisions or expected trends resulting from natural disturbances on similar units of land.

Successional Relationships

The process of change by which biotic communities replace each other and by which the physical environment becomes altered over a period of time is referred to as ***succession*** (Kimmins 1987). Two types of succession characterize vegetation development: ***primary succession*** and ***secondary succession.*** Development of vegetation on newly created soil surfaces, such as on a silted-in lake, or a newly deposited alluvial bar, is ***primary succession.*** This slow process may require many centuries to reach a stable or climax community. ***Secondary succession*** occurs after a disturbance (such as a fire) alters or destroys the vegetation cover, but not the soil. Regeneration and regrowth usually happen quickly from roots or seeds already in the soil. In some severe disturbances, such as soil erosion or fire consumption of a peat substrate, the site may be changed drastically enough to initiate primary succession.

Secondary succession may occur in either of two directions: toward or away from the climax community or potential natural community (PNC). For example, the establishment of *Acer negundo* (Manitoba maple) seedlings under an overstory of cottonwoods would represent progressive succession toward the *Acer negundo/Prunus virginiana* (Manitoba maple/choke cherry) habitat type. The failure of *Acer negundo* to establish itself and the resulting domination of the understory by *Poa pratensis* (Kentucky bluegrass) due to grazing influences could represent regressive succession away from the potential climax. Plant communities that represent steps along the successional pathways toward or away from the potential climax association are called seral stages or seral communities. Major, relatively stable seral or disclimax plant communities are formally defined as ***community types*** in this publication. Descriptions of seral stages and successional relationships are included in the descriptions of each habitat type.

On upland sites, ecologists and land managers have only had to deal with secondary succession. However, in many riparian and wetland situations, primary succession is just as important as secondary succession in accounting for the overall landscape mosaics. One of the most important characteristics of riparian and wetland areas is their dynamic nature. Not only does vegetation in a habitat type change with time and disturbance, but the site itself may also be altered by changes in hydrological or soil conditions. Deep alluvial depositions on floodplains can alter availability of water. Rapid accumulations of organic materials can occur on fens, bogs, and wet meadows, altering the water holding capacity and nutrient availability of the soil. Site potential may change when de-watering occurs (the lowering of the water table) by pumping, draining, or heavy other human land uses. Permanent flooding due to human or wildlife activity (beaver) will also change site potential. Any case where the site has changed significantly will in turn mean a different potential climax community (and habitat type). These changes could be referred to as "site succession."

Developing Reasonable and Attainable Management Goals and Objectives

After riparian and wetland habitat types and community types have been determined for a site, there are several uses of the information. Understanding of the information available in the document will increase over time with use. Some examples of the uses of the information are discussed here.

Land management decisions sometimes require achieving certain vegetative communities in riparian and wetland areas. With the information provided in this document, a good understanding of what is feasible for a site can be determined. For example, on a degraded site with only a scattering of *Salix bebbiana* (beaked willow), the expected canopy cover can be determined from the canopy cover tables in the text and specific objectives can be formulated (i.e., to increase the canopy cover of *Salix bebbiana* (beaked willow) from 2 percent to 55 percent on the stream reach within 12 years). The associated species in the average canopy cover tables can be used to determine species lists for site rehabilitation. For example, on a gravel mining site, there may be no vegetation remaining in the riparian or wetland area. The tables and appendices provide a list of species that may occur on the site. The species that are most desirable, available for planting, or easiest to obtain or establish can be selected.

If the goal is to provide shading of a stream for trout habitat, the tables and appendices will provide a list of species that will grow on a type, so that informed decisions can be made to prevent planting species unsuited for the site. Long term planning, land use decisions, threatened and endangered species consultations, and environmental documents can also be guided by successional information presented in each habitat type or community type.

KEY TO RIPARIAN AND WETLAND SITES OF SASKATCHEWAN PRAIRIE ECOZONE

BACKGROUND

1. This key was designed for use in the Saskatchewan Prairie Ecozone; approximately the southern third of the province. The boundaries of this ecozone (also known as the "study area") are Alberta on the west, Manitoba on the east and the United States to the south and by an indistinct northwest/southeast line from near Lloydminster in the west to near Yorkton in the east. This area contains four ecoregions: the Mixed Grassland, the Moist Mixed Grassland, the Aspen Parkland and the Cypress Upland portion of the Montane Ecoregion (Figure 1).

2. The key identifies first trees, then shrubs, and last the herbaceous types. Within each of these major categories, habitat types generally are identified before community types. The key also generally identifies types in wetter to drier order.

3. The key is designed to identify site potential; if that is not possible due to disturbance, either natural (e.g., recently deposited alluvial bars) and/or human-caused (e.g., livestock overgrazing or the clearing of groves), the key will then take the user to a community type. ***NOTE: This document describes several major seral plant communities (community types) that are stable for time periods important for land management consideration.*** The possible potential(s) for such a site can be projected by reading the Successional Information section of each community type.

4. On severely degraded sites, the user should look at similar, less disturbed, positions on the landscape for indications of what could be there. Read the text of the type description before making a final determination.

5. Types were sampled in stands representing a range of vegetative development from early seral to climax stages, and also a broad range of disturbance.

INSTRUCTIONS

1. Accurately identify and record the canopy cover for all indicator species. The indicator species are those species used in the key.

2. Assure that the plot being classified is representative of the stand you are dealing with as a whole. If not, move the plot. Environmental or vegetation uniformity is a primary consideration in plot selection.

3. Identify potential lifeform using the ***Lifeform Group Key.*** Generally, a tree species is considered successfully reproducing if a density of 10 or more individuals per acre (25/ha) occupies ***or will occupy*** the site.

4. Within the correct lifeform group, determine the Habitat Type or Community Type by following the key literally. ***ALL*** conditions stipulated for each couplet must be satisfied for correct determination. The first set of conditions that yield a result from the key should supply the correct classification. Go then to the description of that habitat type or community type and read it carefully to see if it fits the circumstance on the site. If it does not, then return to the beginning and go through the key again.

5. For sites where the vegetation is obviously depauperate (unusually sparse) because of high grazing or browsing pressure, dense shading, or duff accumulations, ***adjust the key criteria downward*** to reflect the reduced canopy cover. For example, when the key refers to a species with at least 5 percent canopy cover, the critical amount would be reduced to 1 percent. Comparison to the nearest non-depauperate, similar site may assist in the correct determination of type on such altered sites.

In addition, when classifying a site, be aware of and avoid ***microsites***. Microsites are small areas that are atypical of the stand as a whole. Examples include windthrow pockets filled with colluvium/alluvium, raised hummocks of willows growing on old beaver dams, or small seep areas.

6. In sites that are heavily impacted by grazing or browsing pressures, look carefully for ***ANY*** shrub or tree growth or remnants (stumps). In extreme cases, the potential natural community (such as a willow) may be present only as dwarfed, widely scattered individuals. In this case, again adjust the key criteria downward to reflect the reduced canopy cover. Once again, comparison to the nearest non-grazed or non-browsed community occurring on a similar site may assist in correct determination of the type.

7. Habitat type or community type can generally be projected for a site in an early, or disturbed, seral stage by examining the closest location(s) having the same site conditions (soils, hydrologic characteristics, position on the landscape, etc.).

8. ***CAUTION!*** The potential of a site may change if the edaphic and/or hydrologic characteristics are changed.

9. ***Warning! The key is not the classification! Validate your determination by comparing the site characteristics with the written description of the type. Be aware that the environmental conditions described in the text represent sampled sites and personal observations, but may not represent all sites on the landscape on which the type can occur.***

KEY TO LIFEFORM GROUPS

1. Coniferous trees present ***AND*** successfully reproducing (10 or more trees per acre) ***AND NOT*** restricted to microsites. .... **Key to Coniferous Tree Types (p. 32)**

1. Coniferous trees absent ***OR IF PRESENT***, not successfully reproducing, or they are restricted to microsites. 2

    2. *Fraxinus pennsylvanica* (green ash), *Ulmus americana* (American elm), *Acer negundo* (Manitoba maple), or *Populus tremuloides* (aspen) present ***AND*** successfully reproducing (10 or more trees per acre) ***AND NOT*** restricted to microsites. .... **Key to Deciduous Tree Types (p. 32)**

    2. *Fraxinus pennsylvanica* (green ash), *Ulmus americana* (American elm), *Acer negundo* (Manitoba maple), or *Populus tremuloides* (aspen) absent ***OR IF PRESENT***, not successfully reproducing, or are restricted to microsites. 3

3. Deciduous tree species other than *Fraxinus pennsylvanica* (green ash), *Ulmus americana* (American elm), *Acer negundo* (Manitoba maple), or *Populus tremuloides* (aspen) present with a combined canopy cover of at least 25 percent. .... **Key to Deciduous Tree Types (p. 32)**

3. Deciduous trees with a combined canopy cover of less than 25 percent. 4

    4. Shrubs present with a combined canopy cover of at least 10 percent. .... **Key to Shrub Types (p. 34)**

    4. Shrubs with a combined canopy cover of less than 10 percent; herbaceous species with a combined canopy cover of at least 15 percent, or emergent herbaceous species with at least 5 percent canopy cover. .... **Key to Herbaceous Types (p. 37)**

KEY TO CONIFEROUS TREE TYPES

Coniferous trees present ***AND*** successfully reproducing (10 or more trees per acre) ***AND NOT*** restricted to microsites.

1. *Picea glauca* (white spruce) present and reproducing successfully. **2**

1. *Picea glauca* (white spruce) absent, or if present, not reproducing successfully **3**

   2. *Cornus stolonifera* (red-osier dogwood) or willows (*Salix* spp.) present. .... ***Picea glauca/Cornus stolonifera*** **(white spruce/red-osier dogwood) Habitat Type (p. 41)**

   2. *Cornus stolonifera* (red-osier dogwood) or willows (*Salix* spp.) absent. **3**

3. The site has at least one of the following wetland attributes: hydric soils, hydrophytic vegetation, or wetland hydrology. .... **Unclassified Riparian or Wetland Site**

   In this case, where the site does not fit any other type in the key, name the site in terms of a Dominance Type (Cover Type), which is the species with the greatest canopy cover over 25 percent in the overstory, or tallest vegetation layer.

3. The site has none of the following wetland attributes: hydric soils, hydrophytic vegetation, wetland hydrology. .... **Upland Site**

KEY TO DECIDUOUS TREE TYPES

Fraxinus pennsylvanica (green ash), *Ulmus americana* (American elm), *Acer negundo* (Manitoba maple), or *Populus tremuloides* (aspen) present ***AND*** successfully reproducing (10 or more trees per acre) ***AND NOT*** restricted to microsites, ***OR*** deciduous tree species other than *Fraxinus pennsylvanica* (green ash), *Acer negundo* (Manitoba maple), or *Populus tremuloides* (aspen) with a combined canopy cover of at least 25 percent.

1. *Fraxinus pennsylvanica* (green ash), *Ulmus americana* (American elm), *Acer negundo* (Manitoba maple), or *Populus tremuloides* (aspen) with at least 5 percent canopy cover. **2**

1. *Fraxinus pennsylvanica* (green ash), *Ulmus americana* (American elm), *Acer negundo* (Manitoba maple), or *Populus tremuloides* (aspen) with less than 5 percent canopy cover. **6**

   2. *Fraxinus pennsylvanica* (green ash) or *Ulmus americana* (American elm) with at least 5 percent canopy cover.......... .... ***Fraxinus pennsylvanica/Prunus virginiana*** **(green ash/choke cherry) Habitat Type (p. 52)**

   2. *Fraxinus pennsylvanica* (green ash) or Ulmus americana (American elm) with less than 5 percent canopy cover. **3**

3. *Acer negundo* (Manitoba maple) with at least 5 percent canopy cover. .... ***Acer negundo/Prunus virginiana*** **(Manitoba maple/choke cherry) Habitat Type (p. 45)**

3. *Acer negundo* (Manitoba maple) with less than 5 percent canopy cover ***AND Populus tremuloides*** (aspen) with at least 5 percent canopy cover. **4**

   4. *Cornus stolonifera* (red-osier dogwood) or Willows (*Salix* spp.), individually or in combination, with at least 5 percent canopy cover; *Picea glauca* (white spruce) absent, or if present, not reproducing successfully (less than 10 trees per acre) .... ***Populus tremuloides/Cornus stolonifera*** **(aspen/red-osier dogwood) Habitat Type (p. 114)**

4. *Cornus stolonifera* (red-osier dogwood) or Willows (*Salix* spp.), individually or in combination, with less than 5 percent canopy cover; *Picea glauca* (white spruce) absent, or if present, not reproducing successfully (less than 10 trees per acre).. 5

5. Shrubs with at least 25 percent canopy cover..
....***Populus tremuloides/Symphoricarpos occidentalis*** **(aspen/buckbrush) Community Type (p. 123)**

5. Shrubs with less than 25 percent canopy cover..
....***Populus tremuloides*/Herbaceous (aspen/herbaceous) Community Type (p. 119)**

6. *Populus balsamifera* (balsam poplar) or *P. deltoides* (plains cottonwood) with a greater canopy cover than other individual tree species.. 7

6. Other individual tree species with a greater canopy cover than both *Populus balsamifera* (balsam poplar) and *P. deltoides* (plains cottonwood).. 14

7. *Populus balsamifera* (balsam poplar) with a greater canopy cover than *P. deltoides* (plains cottonwood).. 8

7. *Populus deltoides* (plains cottonwood) with a greater canopy cover than *P. balsamifera* (balsam poplar).. 11

8. Seedling or sapling age classes (dbh < 13 cm [5.0 in]) of *Populus balsamifera* (balsam poplar) dominate the site; site is a recently deposited alluvial bar..
....***Populus balsamifera*/Recent Alluvial Bar (balsam poplar/recent alluvial bar) Community Type (p. 76)**

8. Pole or mature age classes (dbh > 13 cm [5.0 in]) of *Populus balsamifera* (balsam poplar) dominate.. 9

9. Shrubs with at least 25 percent canopy cover.. 10

9. Shrubs with less than 25 percent canopy cover..
....***Populus balsamifera*/Herbaceous (balsam poplar/herbaceous) Community Type (p. 69)**

10. *Cornus stolonifera* (red-osier dogwood) with at least 1 percent canopy cover..
....***Populus balsamifera/Cornus stolonifera*** **(balsam poplar/red-osier dogwood) Community Type (p. 62)**

10. *Cornus stolonifera* (red-osier dogwood) with less than 1 percent canopy cover..
....***Populus balsamifera/Symphoricarpos occidentalis*** **(balsam poplar/buckbrush) Community Type (p. 81)**

11. Seedling or sapling age classes (dbh < 13 cm [5.0 in]) of Populus deltoides (plains cottonwood) dominate the site; site is a recently deposited alluvial bar..
....***Populus deltoides*/Recent Alluvial Bar (plains cottonwood/recent alluvial bar) Community Type (p. 101)**

11. Pole or mature age classes (dbh > 5.0 inches) of *Populus deltoides* (plains cottonwood) dominate the site.. 12

12. Shrub species with at least 25 percent canopy cover.. 13

12. Shrub species with less than 25 percent canopy cover..
....***Populus deltoides*/Herbaceous (plains cottonwood/herbaceous) Community Type (p. 95)**

13. *Cornus stolonifera* (red-osier dogwood) with at least 1 percent canopy cover. .... ***Populus deltoides/Cornus stolonifera* (plains cottonwood/red-osier dogwood) Community Type (p. 89)**

13. *Cornus stolonifera* (red-osier dogwood) with less than 1 percent canopy cover. .... ***Populus deltoides/Symphoricarpos occidentalis* (plains cottonwood/buckbrush) Community Type (p. 107)**

14. Site with at least one of the following wetland attributes present: hydric soils, hydrophytic vegetation, wetland hydrology. .... **Unclassified Riparian or Wetland Site**

In this case, where the site does not fit any other type in the key, name the site in terms of a Dominance Type (Cover Type), which is the species with the greatest canopy cover over 25 percent in the overstory, or tallest vegetation layer.

14. The site has none of the following wetland attributes present: hydric soils, hydrophytic vegetation, wetland hydrology. .... **Upland Site**

KEY TO SHRUB TYPES

Shrubs with a combined canopy cover of at least 10 percent.

1. Willows (*Salix* spp.) with at least 10 percent canopy cover .... **Willow Shrub Key (p. 34)**

1. Willows (*Salix* spp.) with less than 10 percent canopy cover. .... **Non-Willow Shrub Key (p. 36)**

KEY TO WILLOW SHRUB TYPES

1. *Salix bebbiana* (beaked willow) or *Salix lutea* (yellow willow), individually or in combination, with at least 10 percent canopy cover. 2

1. *Salix bebbiana* (beaked willow) or *Salix lutea* (yellow willow), individually or in combination, with less than 10 percent canopy cover. 6

2. *Salix lutea* (yellow willow) with greater canopy cover than *Salix bebbiana* (beaked willow). 3

2. *Salix bebbiana* (beaked willow) with greater canopy cover than *Salix lutea* (yellow willow). 4

3. *Cornus stolonifera* (red-osier dogwood) with at least 1 percent canopy cover. .... ***Salix lutea/Cornus stolonifera* (yellow willow/red-osier dogwood) Habitat Type (p. 155)**

3. *Cornus stolonifera* (red-osier dogwood) with less than 1 percent canopy cover. .... ***Salix lutea* (yellow willow) Community Type (p. 160)**

4. *Carex atherodes* (awned sedge), *C. rostrata* (beaked sedge), or *C. aquatilis* (water sedge), individually or in combination, with at least 10 percent canopy cover *AND Cornus stolonifera* (red-osier dogwood) with less than 5 percent canopy cover. .... ***Salix bebbiana/Carex atherodes* (beaked willow/awned sedge) Habitat Type (p. 132)**

4. *Carex atherodes* (awned sedge), *C. rostrata* (beaked sedge), or *C. aquatilis* (water sedge), individually or in combination, with less than 10 percent canopy cover ***OR Cornus stolonifera*** (red-osier dogwood) with at least 5 percent canopy cover. **5**

5. *Cornus stolonifera* (red-osier dogwood) with at least 1 percent canopy cover.......... ***Salix bebbiana/Cornus stolonifera* (beaked willow/red-osier dogwood) Community Type (p. 138)**

5. *Cornus stolonifera* (red-osier dogwood) with less than 1 percent canopy cover.......... ***Salix bebbiana* (beaked willow) Community Type (p. 144)**

6. *Salix petiolaris* (basket willow) with greater canopy cover than other willow species.......... **7**

6. *Salix petiolaris* (basket willow) with less canopy cover than other willow species. **9**

7. *Carex atherodes* (awned sedge), *C. rostrata* (beaked sedge), or *C. aquatilis* (water sedge), individually or in combination, with at least 1 percent canopy cover.......... ***Salix petiolaris/Carex atherodes* (basket willow/awned sedge) Habitat Type (p. 163)**

7. *Carex atherodes* (awned sedge), *C. rostrata* (beaked sedge), or *C. aquatilis* (water sedge), individually or in combination, with less than 1 percent canopy cover.......... **8**

8. Shrub species other than *Salix petiolaris* (basket willow) with at least 10 percent canopy cover, ***AND Cornus stolonifera*** (red-osier dogwood) or other willow species, individually or in combination, with at least 1 percent canopy cover.......... ***Salix petiolaris/Cornus stolonifera* (basket willow/red-osier dogwood) Habitat Type (p. 166)**

8. Shrub species other than *Salix petiolaris* (basket willow) with less than 10 percent canopy cover, ***OR Cornus stolonifera*** (red-osier dogwood) or other willow species, individually or in combination, with less than 1 percent canopy cover. .... ***Salix petiolaris* (basket willow) Community Type (p. 170)**

9. Individual non-willow shrub species with greater canopy cover than any individual willow shrub species.......... **GO TO THE NON-WILLOW KEY (p. 36)**

9. Individual willow shrub species with greater canopy cover than any individual non-willow shrub species.......... **10**

10. *Salix amygdaloides* (peach-leaved willow) with a greater canopy cover than other individual shrub species. .... ***Salix amygdaloides* (peach-leaved willow) Community Type (p. 128)**

10. Other individual shrub species with a greater canopy cover than *Salix amygdaloides* (peach-leaved willow).......... **11**

11. *Salix exigua* (sandbar willow) has a greater canopy cover than any other individual willow species.......... ***Salix exigua* (sandbar willow) Community Type (p. 149)**

11. Other individual willow species with a greater canopy cover than *Salix exigua* (sandbar willow). **12**

12. The site has at least one of the following wetland attributes present: hydric soils, hydrophytic vegetation, wetland hydrology. .... **Unclassified Riparian or Wetland Site**

In this case, where the site does not fit any other type in the key, name the site in terms of a Dominance Type (Cover Type), which is the species with the greatest canopy cover over 25 percent in the overstory, or tallest vegetation layer.

12. The site has none of the following wetland attributes present: hydric soils, hydrophytic vegetation, wetland hydrology. .... **Upland Site**

KEY TO NON-WILLOW SHRUB TYPES

1. *Artemisia cana* (silver sagebrush) with at least 10 percent canopy cover. .... ***Artemisia cana/Agropyron smithii* (silver sagebrush/western wheat grass) Habitat Type (p. 176)**

1. *Artemisia cana* (silver sagebrush) with less than 10 percent canopy cover. **2**

2. *Sarcobatus vermiculatus* (greasewood) with at least 10 percent canopy cover. .... ***Sarcobatus vermiculatus/Agropyron smithii* (greasewood/western wheat grass) Habitat Type (p. 200)**

2. *Sarcobatus vermiculatus* (greasewood) with less than 10 percent canopy cover. **3**

3. ***Betula occidentalis*** (water birch) with at least 15 percent canopy cover ***AND WITH*** the greatest canopy cover in the tallest layer. .... ***Betula occidentalis* (water birch) Community Type (p. 181)**

3. ***Betula occidentalis*** (water birch) with less than 15 percent canopy cover ***OR WITHOUT*** the greatest canopy cover in the tallest layer. **4**

4. ***Shepherdia argentea*** (thorny buffaloberry) with at least 15 percent canopy cover ***AND WITH*** the greatest canopy cover in the tallest layer. .... ***Shepherdia argentea* (thorny buffaloberry) Community Type (p. 203)**

4. ***Shepherdia argentea*** (thorny buffaloberry) with less than 15 percent canopy cover ***OR WITHOUT*** the greatest canopy cover in the tallest layer. **5**

5. ***Crataegus rotundifolia*** (round-leaved hawthorn) or *C. douglasii* (Douglas hawthorn), individually or in combination, with at least 15 percent canopy cover ***AND WITH*** the greatest canopy cover in the tallest layer. .... ***Crataegus rotundifolia* (round-leaved hawthorn) Community Type (p. 186)**

5. ***Crataegus rotundifolia*** (round-leaved hawthorn) or *C. douglasii* (Douglas hawthorn), individually or in combination, with less than 15 percent canopy cover ***OR WITHOUT*** the greatest canopy cover in the tallest layer. **6**

6. ***Prunus virginiana*** (choke cherry) with at least 15 percent canopy cover ***AND WITH*** the greatest canopy cover in the tallest layer. .... ***Prunus virginiana* (choke cherry) Community Type (p. 194)**

6. ***Prunus virginiana*** (choke cherry) with less than 15 percent canopy cover ***OR WITHOUT*** the greatest canopy cover in the tallest layer. **7**

7. ***Amelanchier alnifolia*** (Saskatoon) with at least 15 percent canopy cover ***AND WITH*** the greatest canopy cover in the tallest layer. .... ***Amelanchier alnifolia* (Saskatoon) Community Type (p. 173)**

7. *Amelanchier alnifolia* (Saskatoon) with less than 15 percent canopy cover ***OR WITHOUT*** the greatest canopy cover in the tallest layer. **8**

 8. *Elaeagnus commutata* (silverberry) with at least 15 percent canopy cover ***AND WITH*** the greatest canopy cover in the tallest layer. .... ***Elaeagnus commutata* (silverberry) Community Type (p. 190)**

 8. *Elaeagnus commutata* (silverberry) with less than 15 percent canopy cover ***OR WITHOUT*** the greatest canopy cover in the tallest layer.......... **9**

9. *Rosa woodsii* (common wild rose) or *R. acicularis* (prickly rose), individually or in combination, with at least 15 percent canopy cover ***AND WITH*** the greatest canopy cover in the tallest layer. .... ***Rosa woodsii* (common wild rose) Community Type (p. 197)**

9. *Rosa woodsii* (common wild rose) or *R. acicularis* (prickly rose), individually or in combination, with less than 15 percent canopy cover ***OR WITHOUT*** the greatest canopy cover in the tallest layer.......... **10**

 10. *Symphoricarpos occidentalis* (buckbrush) or *S. albus* (snowberry) individually or in combination, with at least 15 percent canopy cover ***AND WITH*** the greatest canopy cover in the tallest layer. .... ***Symphoricarpos occidentalis* (buckbrush) Community Type (p. 207)**

 10. *Symphoricarpos occidentalis* (buckbrush) or *S. albus* (snowberry), individually or in combination, with less than 15 percent canopy cover ***OR WITHOUT*** the greatest canopy cover in the tallest layer.......... **11**

11. The site has at least one of the following wetland attributes present: hydric soils, hydrophytic vegetation, wetland hydrology. .... **Unclassified Riparian or Wetland Site**

 In this case, where the site does not fit any other type in the key, name the site in terms of a Dominance Type (Cover Type), which is the species with the greatest canopy cover over 25 percent in the overstory, or tallest vegetation layer.

11. The site has none of the following wetland attributes: hydric soils, hydrophytic vegetation, wetland hydrology. .... **Upland Site**

KEY TO HERBACEOUS TYPES

Herbaceous species present with a combined canopy cover of at least 15 percent, or emergent herbaceous species with at least 5 percent canopy cover.

1. Sedges (*Carex* spp.) with a combined canopy cover of at least 25 percent.......... **Sedge Key (p. 37)**

1. Sedges (*Carex* spp.) without a combined canopy cover of at least 25 percent. .... **Non-Sedge Key (p. 38)**

KEY TO SEDGE TYPES

1. *Carex atherodes* (awned sedge) with greater canopy cover than all other sedge species.......... ***Carex atherodes* (awned sedge) Habitat Type (p. 216)**

1. *Carex atherodes* (awned sedge) with less canopy cover than other sedge species.......... **2**

2. *Carex aquatilis* (water sedge) with greater canopy cover than all other sedge species. .... ***Carex aquatilis* (water sedge) Habitat Type (p. 212)**

2. *Carex aquatilis* (water sedge) with less canopy cover than other sedge species. 3

3. *Carex lanuginosa* (woolly sedge) or *C. lasiocarpa* (hairy-fruited sedge), individually or in combination, with greater canopy cover than all other sedge species. ....***Carex lanuginosa* (woolly sedge) Habitat Type (p. 219)**

3. *Carex lanuginosa* (woolly sedge) or *C. lasiocarpa* (hairy-fruited sedge), in combination, with less canopy cover than other sedge species.. 4

4. The site has at least one of the following wetland attributes present: hydric soils, hydrophytic vegetation, wetland hydrology. ....**Unclassified Riparian or Wetland Site**

In this case, where the site does not fit any other type in the key, name the site in terms of a Dominance Type (Cover Type), which is the species with the greatest canopy cover over 25 percent in the overstory, or tallest vegetation layer.

4. The site has none of the following wetland attributes: hydric soils, hydrophytic vegetation, wetland hydrology. ....**Upland Site**

KEY TO NON-SEDGE TYPES

1. *Typha latifolia* (common cattail) or *T. angustifolia* (narrow-leaved cattail), individually or in combination, with at least 25 percent canopy cover. ....***Typha latifolia* (common cattail) Habitat Type (p. 267)**

1. *Typha latifolia* (common cattail) or *T. angustifolia* (narrow-leaved cattail), individually or in combination, with less than 25 percent canopy cover. 2

2. *Scirpus acutus* (great bulrush) or *S. validus* (common great bulrush), individually or in combination, with at least 15 percent canopy cover. ....***Scirpus acutus* (great bulrush) Habitat Type (p. 258)**

2. *Scirpus acutus* (great bulrush) or *S. validus* (common great bulrush), individually or in combination, with less than 15 percent canopy cover. 3

3. *Phragmites australis* (reed) with at least 25 percent canopy cover. ......***Phragmites australis* (reed) Habitat Type (p. 248)**

3. *Phragmites australis* (reed) with less than 25 percent canopy cover. 4

4. *Phalaris arundinacea* (reed canary grass) with at least 25 percent canopy cover. ....***Phalaris arundinacea* (reed canary grass) Habitat Type (p. 245)**

4. *Phalaris arundinacea* (reed canary grass) with less than 25 percent canopy cover. 5

5. *Scolochloa festucacea* (spangletop) with at least 25 percent canopy cover. .... ***Scolochloa festucacea* (spangletop) Habitat Type (p. 265)**

5. *Scolochloa festucacea* (spangletop) with less than 25 percent canopy cover. 6

6. *Scirpus paludosus* (alkali bulrush) with at least 15 percent canopy cover. .... ***Scirpus paludosus*** **(alkali bulrush) Habitat Type (p. 260)**

6. *Scirpus paludosus* (alkali bulrush) with less than 15 percent canopy cover. **7**

7. *Scirpus pungens* (three-square rush) with at least 15 percent canopy cover. .... ***Scirpus pungens*** **(three-square rush) Habitat Type (p. 262)**

7. *Scirpus pungens* (three-square rush) with less than 15 percent canopy cover. **8**

8. *Eleocharis palustris* (creeping spike-rush) or *E. acicularis* (needle spike-rush), individually or in combination, with at least 25 percent canopy cover. .... ***Eleocharis palustris*** **(creeping spike-rush) Habitat Type (p. 238)**

8. *Eleocharis palustris* (creeping spike-rush) or *E. acicularis* (needle spike-rush), individually or in combination, with less than 25 percent canopy cover. **9**

9. *Puccinellia nuttalliana* (Nuttall's salt-meadow grass) with at least 15 percent canopy cover. .... ***Puccinellia nuttalliana*** **(Nuttall's salt-meadow grass) Habitat Type (p. 254)**

9. *Puccinellia nuttalliana* (Nuttall's salt-meadow grass) with less than 15 percent canopy cover. **10**

10. *Deschampsia cespitosa* (tufted hair grass) with at least 15 percent canopy cover. .... ***Deschampsia cespitosa*** **(tufted hair grass) Habitat Type (p. 233)**

10. *Deschampsia cespitosa* (tufted hair grass) with less than 15 percent canopy cover. **11**

11. *Distichlis stricta* (salt grass) with at least 15 percent canopy cover. .... ***Distichlis stricta*** **(salt grass) Habitat Type (p. 236)**

11. *Distichlis stricta* (salt grass) with less than 15 percent canopy cover. **12**

12. *Agropyron* smithii (western wheat grass) with at least 25 percent canopy cover. .... ***Agropyron smithii*** **(western wheat grass) Habitat Type (p. 223)**

12. *Agropyron smithii* (western wheat grass) with less than 25 percent canopy cover. .... **READ THE FOLLOWING PARAGRAPH**

The following herbaceous communities represent seral or human-caused disturbance communities. Before you use this portion of the key, do the following:

A. Carefully examine the stand and determine if ***ANY*** trees or shrubs are present. If so, go back through the tree or shrub key and reduce all canopy coverages to "present."

B. If ***NO*** tree or shrub species are present, then go back through the herbaceous key and reduce all canopy coverages to 5 percent.

C. If the stand still does not key out, then use the following key to ***EITHER*** major seral or disturbance herbaceous community types ***OR*** unclassified riparian or wetland sites.

1. *Polygonum coccineum* (water smartweed) and *P. amphibium* (water smartweed), individually or in combination, with a greater canopy cover than any other individual herbaceous species. .... ***Polygonum coccineum*** **(water smartweed) Community Type (p. 253)**

1. Other individual herbaceous species with a greater canopy cover than *Polygonum coccineum* (water smartweed) and *P. amphibium* (water smartweed). 2

  2. *Salicornia europaea* (samphire) with a greater canopy cover than any other individual herbaceous species. .... ***Salicornia europaea*** **(samphire) Community Type (p. 256)**

  2. Other individual herbaceous species with a greater canopy cover than *Salicornia europaea* (samphire).......... 3

3. *Calamagrostis inexpansa* (northern reedgrass) or *C. stricta* (narrow reedgrass), individually or in combination, with at least 25 percent canopy cover.......... ***Calamagrostis stricta*** **(narrow reedgrass) Community Type (p. 230)**

3. *Calamagrostis inexpansa* (northern reedgrass), or *C. stricta* (narrow reedgrass), individually or in combination, with less than 25 percent canopy cover. 4

  4. *Juncus balticus* (wire rush) with a greater canopy cover than any other individual herbaceous species. .... ***Juncus balticus*** **(wire rush) Community Type (p. 243)**

  4. Other individual herbaceous species with a greater canopy cover than *Juncus balticus* (wire rush). 5

5. *Hordeum jubatum* (foxtail barley) with a greater canopy cover than any other individual herbaceous species. .... ***Hordeum jubatum*** **(foxtail barley) Community Type (p. 241)**

5. Other individual herbaceous species with a greater canopy cover than *Hordeum jubatum* (foxtail barley). 6

  6. *Poa pratensis* (Kentucky bluegrass) with greater canopy cover than any other individual herbaceous species. .... ***Poa pratensis*** **(Kentucky bluegrass) Community Type (p. 250)**

  6. Other individual herbaceous species with a greater canopy cover than *Poa pratensis* (Kentucky bluegrass). 7

7. *Bromus inermis* (awnless brome) with a greater canopy cover than any other individual herbaceous species. .... ***Bromus inermis*** **(awnless brome) Community Type (p. 227)**

7. Other individual herbaceous species with greater canopy cover than *Bromus inermis* (awnless brome).......... 8

  8. Site with at least one of the following wetland attributes present: hydric soils, hydrophytic vegetation, wetland hydrology. .... **Unclassified Riparian or Wetland Site**

  In this case, if the site does not fit any other type in the key, name the site in terms of a Dominance Type (Cover Type), which is the species with the greatest canopy cover over 25 percent in the overstory, or tallest vegetation layer.

  8. Site withnone of the following wetland attributes present: hydric soils, hydrophytic vegetation, wetland hydrology. .... **Upland Site**

CONIFEROUS TREE TYPES

Picea glauca/Cornus stolonifera Habitat Type
(White Spruce/Red-Osier Dogwood Habitat Type)

PICEGLA/CORNSTO
Number of Stands Sampled = 14
Number of Stands Sampled in Saskatchewan = 2

LOCATION AND ASSOCIATED LANDFORMS

The *Picea glauca/Cornus stolonifera* (white spruce/red-osier dogwood) habitat type is a minor type occurring at mid to higher elevations within the Saskatchewan Prairie Ecozone, primarily in the Cypress Uplands. This type occurs on moist sites on gently undulating or flat alluvial benches, on terraces bordering streams, and in steep, wooded draws leading into river valleys.

VEGETATION

The relatively closed overstory contains mature *Picea glauca* (white spruce). Some sites may have scattered *Populus balsamifera* (balsam poplar) and *Populus tremuloides* (aspen) present.

Shrub cover can be abundant. Major species may be *Cornus stolonifera* (red-osier dogwood), *Symphoricarpos occidentalis* (buckbrush), and *Amelanchier alnifolia* (Saskatoon). Herbaceous cover can range from sparse to high. Stand species' richness may be high, but constancy and cover for most species is low (Table 3). Herbaceous species with high constancy include *Smilacina stellata* (star-flowered Solomon's-seal), *Fragaria virginiana* (wild strawberry), *Galium boreale* (northern bedstraw), *Osmorhiza occidentalis* (western sweet cicely), and *Equisetum arvense* (common horsetail).

Table 3. Average canopy cover, range of canopy cover, and constancy for species recorded in 4 late seral to climax stands of the *Picea glauca/Cornus stolonifera* (white spruce/red-osier dogwood) habitat type

TABLE 3.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Trees			
Betula papyrifera (white birch)	7	0-20	64
Picea glauca (white spruce)	24	3-60	100
Populus balsamifera (balsam poplar)	33	0-70	73
Populus tremuloides (aspen)	21	0-70	55
Shrubs			
Alnus tenuifolia (river alder)	8	0-20	55
Amelanchier alnifolia (Saskatoon)	3	0-10	73
Cornus canadensis (bunchberry)	2	0-3	45
Cornus stolonifera (red-osier dogwood)	10	1-30	100
Corylus cornuta (beaked hazelnut)	3	0-3	9
Elaeagnus commutata (silverberry)	12	0-20	18
Linnaea borealis (twinflower)	3	0-10	55
Lonicera dioica (twining honeysuckle)	1	0-1	18
Lonicera involucrata (bracted honeysuckle)	3	0-10	55
Prunus virginiana (choke cherry)	1	0-3	27
Ribes americanum (wild black currant)	3	0-3	9
Ribes lacustre (bristly black currant)	1	0-3	36
Ribes oxyacanthoides (northern gooseberry)	2	0-3	36
Ribes triste (wild red currant)	3	0-3	18
Rosa spp. (rose)	7	1-20	100
Rubus idaeus (wild red raspberry)	6	0-10	73
Rubus pubescens (dewberry)	4	0-10	64
Salix bebbiana (beaked willow)	10	0-10	18
Salix exigua (sandbar willow)	1	0-1	9
Salix lucida (shining willow)	1	0-1	9
Salix lutea (yellow willow)	10	0-10	9
Salix myrtillifolia (myrtle-leaved willow)	1	0-1	9
Salix pseudomonticola (false mountain willow)	1	0-1	18
Salix scouleriana (Scouler's willow)	1	0-3	36
Shepherdia canadensis (Canada buffaloberry)	1	0-3	36
Symphoricarpos albus (snowberry)	1	0-1	27
Symphoricarpos spp. (buckbrush)	1	0-1	9
Symphoricarpos occidentalis (buckbrush)	3	0-10	45

TABLE 3.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Viburnum edule (low-bush cranberry)	8	0-20	64
Graminoids			
Agropyron repens (quack grass)	5	0-10	18
Agropyron trachycaulum (slender wheat grass)	1	0-1	9
Bromus altissimus (Canada brome)	1	0-1	9
Bromus ciliatus (fringed brome)	1	0-1	18
Bromus inermis (awnless brome)	7	0-10	18
Calamagrostis canadensis (bluejoint)	4	0-10	55
Carex microglochin (short-awned sedge)	1	0-1	9
Carex rossii (Ross' sedge)	1	0-1	9
Carex sprengelii (Sprengel's sedge)	1	0-1	9
Carex spp. (sedge)	2	0-3	36
Elymus innovatus (hairy wild rye)	3	0-3	9
Glyceria striata (fowl manna grass)	3	0-3	9
Grass (grass)	1	0-1	9
Oryzopsis asperifolia (white-grained mountain rice grass)	3	0-3	9
Phleum pratense (timothy)	2	0-3	18
Poa palustris (fowl bluegrass)	10	0-20	18
Poa pratensis (Kentucky bluegrass)	2	0-3	36
Schizachne purpurascens (purple oat grass)	1	0-1	18
Trisetum cernuum (nodding trisetum)	3	0-3	9
Forbs			
Achillea millefolium (common yarrow)	1	0-1	9
Achillea sibirica (many-flowered yarrow)	1	0-1	18
Actaea rubra (red and white baneberry)	1	0-1	18
Agrimonia striata (agrimony)	1	0-1	9
Aquilegia spp. (columbine)	1	0-1	9
Aralia nudicaulis (wild sarsaparilla)	12	0-30	64
Aster ciliolatus (Lindley's aster)	3	0-3	9
Aster conspicuus (showy aster)	2	0-3	55
Aster hesperius (western willow aster)	3	0-3	9
Aster laevis (smooth aster)	1	0-3	27
Aster spp. (aster)	2	0-3	18
Chrysanthemum leucanthemum (ox-eye daisy)	1	0-1	9
Cicuta maculata (water-hemlock)	2	0-3	18
Circaea alpina (small enchanter's nightshade)	1	0-1	9
Cirsium arvense (Canada thistle)	1	0-1	9
Disporum trachycarpum (fairybells)	1	0-1	9
Epilobium angustifolium (common fireweed)	1	0-3	55
Fragaria virginiana (wild strawberry)	3	0-10	64
Galeopsis tetrahit (hemp-nettle)	20	0-20	9
Galium boreale (northern bedstraw)	1	0-1	73
Galium triflorum (sweet-scented bedstraw)	2	0-10	64
Geranium richardsonii (wild white geranium)	2	0-3	18
Geum macrophyllum (large-leaved yellow avens)	3	0-3	9
Habenaria spp. (bog orchid)	1	0-1	9
Heracleum lanatum (cow parsnip)	1	0-1	27
Lappula squarrosa (bluebur)	1	0-1	9
Lathyrus ochroleucus (cream-colored vetchling)	1	0-3	55
Maianthemum canadense (wild lily-of-the-valley)	1	0-1	36
Mentha arvensis (wild mint)	3	0-3	9
Mertensia paniculata (tall lungwort)	1	0-1	55
Mitella nuda (bishop's-cap)	1	0-3	36
Osmorhiza depauperata (spreading sweet cicely)	1	0-1	27
Petasites palmatus (palmate-leaved coltsfoot)	2	0-3	45
Pyrola asarifolia (common pink wintergreen)	2	0-10	45
Ranunculus abortivus (small-flowered buttercup)	1	0-1	9
Scutellaria galericulata (marsh skullcap)	1	0-1	9
Senecio pauperculus (balsam groundsel)	1	0-1	9
Smilacina stellata (star-flowered Solomon's-seal)	1	0-3	55
Solidago canadensis (Canada goldenrod)	2	0-3	18
Solidago spp. (goldenrod)	1	0-1	9
Stellaria calycantha (northern stitchwort)	1	0-1	9
Stellaria longipes (long-stalked chickweed)	1	0-1	9
Taraxacum officinale (common dandelion)	2	0-3	45
Thalictrum spp. (meadow rue)	1	0-1	9
Thalictrum venulosum (veiny meadow rue)	5	0-10	27
Trientalis borealis (northern starflower)	1	0-1	27
Urtica dioica (common nettle)	2	0-3	18

TABLE 3.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Veronica americana (American brooklime)	1	0-1	9
Vicia americana (wild vetch)	1	0-3	73
Viola adunca (early blue violet)	1	0-1	9
Viola canadensis (western Canada violet)	3	0-3	9
Viola orbiculata (evergreen violet)	2	0-3	18
Ferns and Allies			
Equisetum arvense (common horsetail)	5	0-10	73

SUCCESSIONAL INFORMATION

Picea glauca (white spruce) establishes quickly on disturbed sites but assumes dominance slowly. *Populus balsamifera* (balsam poplar) may form a major component of the overstory. Shrub cover is typically moderate with major species being *Amelanchier alnifolia* (Saskatoon), *Cornus stolonifera* (red-osier dogwood), and *Symphoricarpos occidentalis* (buckbrush). Herbaceous cover is moderate and includes *Elymus canadensis* (Canada wild rye), *Osmorhiza occidentalis* (western sweet cicely), and *Smilacina stellata* (star-flowered Solomon's-seal).

SOILS

Parent material is usually alluvium and soils are generally Brunisols, Chernozems, or Regosols often with Histic and Aquic characteristics (e.g. high organic matter accumulations, redox depletions [gleyed soil], redox concentrations [mottling] and high water tables). Soils textures vary little between clay loam and silt loam with coarse fragments common throughout. Water tables typically remain within 1 m (39 in) of the surface throughout the growing season.

ADJACENT COMMUNITIES

Adjacent wetter types may include various *Salix* (willow) species types. Adjacent upland types may be dominated by *Picea glauca* (white spruce) with upland understory specie or *Pinus* (pine) species.

MANAGEMENT INFORMATION

Livestock

Herbage production is low to moderate. The dense overstory tends to limit forage production, thereby limiting utility to livestock other than as cover.

Timber

Timber productivity is moderate. Streamside locations and high water tables may restrict timber harvest.

Wildlife

Deer and elk appear to use this type for winter cover. Some sites may show sustained heavy use by moose and elk. *Cornus stolonifera* (red-osier dogwood) is highly preferred by wildlife and livestock. Its abundance is a direct indication of past and current use levels. In some areas, livestock browsing of this species may be quite high.

Fisheries

Those stands of the *Picea glauca/Cornus stolonifera* (white spruce/red-osier dogwood) habitat type adjacent to streams provide hiding, thermal cover, debris recruitment, and streambank stability for fish. *Cornus stolonifera* (red-osier dogwood) is an excellent shrub for controlling erosion along streams. This is particularly important on the higher gradient streams where scouring by seasonal flooding is possible.

Fire

Fire susceptibility is low. However, *Picea glauca* (white spruce) is easily killed by fire (Fischer and Bradley 1987). The dead, dry, flammable lower limbs, low growing canopy, thin bark, and lichen growth in the branches contribute to susceptibility of the species to fire. The shallow root system is readily subject to injury from fire burning through the duff. Large older trees may occasionally survive one or more light fires, but deep accumulations of resinous needle litter around their bases usually make them very susceptible to fire damage.

Cornus stolonifera (red-osier dogwood) and the associated shrub species can survive all but the most severe fires that remove duff and cause extended heating of the upper layer of soil. After a fire, the shrub sprouts from the surviving rhizomes or stolons (runners) (Fischer and Bradley 1987).

Soil Management and Rehabilitation Opportunities
Machinery and livestock easily compact or otherwise damage the soil during periods with high water tables. Poorly drained sites, streamside locations, or sites with organic soils should also warrant special concern. Roads and trails should be located on adjacent uplands.

Recreational Uses and Considerations
Because of high water tables and the problems with road construction, campgrounds should not be located in this type.

OTHER STUDIES

A *Picea/Cornus stolonifera* (spruce/red-osier dogwood) habitat type is described by Hansen and others (1995) for the mountains and foothills of Montana. Similar communities have been described for eastern Idaho and western Wyoming (Youngblood and others 1985b) and for Utah and southeastern Idaho (Padgett and others 1989).

Acer negundo/Prunus virginiana Habitat Type
(Manitoba Maple/Choke Cherry Habitat Type)

ACERNEG/PRUNVIR
Number of Stands Sampled =35
Number of Stands Sampled in Saskatchewan =18

LOCATION AND ASSOCIATED LANDFORMS

The *Acer negundo/Prunus virginiana* (Manitoba maple/choke cherry) habitat type occupies similar landforms as the *Fraxinus pennsylvanica/Prunus virginiana* (green ash/choke cherry) habitat type. It is a minor type in Saskatchewan, occurring throughout the Prairie Ecozone of the province, where it represents the northern range extension of this tree species. This habitat type occurs along streams, rivers, lakes, springs, and ponds where it occupies terraces, fans, or floodplain positions. It is found in V-shaped ravines (also called woody draws) where sites may be occasionally flooded by overland flows.

In the Prairie Ecozone of Canada, where the brown and dark brown soils of the Chernozemic order usually support grassland or shrubland vegetation, taller woodland vegetation is generally confined to stream courses or other landscape positions where landform and topography permit accumulation of moisture in excess of local incident precipitation. Sites can be found on higher (older) terraces of the South Saskatchewan, Qu'Appelle, Oxbow, and Wood Rivers. Examples of this type, located in woody draws, can be found around Cypress Lake and Blackstrap Lake.

VEGETATION

The *Acer negundo/Prunus virginiana* (Manitoba maple/choke cherry) habitat type is floristically similar to the *Fraxinus pennsylvanica/Prunus virginiana* (green ash/choke cherry) habitat type with the difference being the absence of *Fraxinus pennsylvanica* (green ash) in the former.

The tree layer of the *Acer negundo/Prunus virginiana* (Manitoba maple/choke cherry) habitat type is dominated by *Acer negundo* (Manitoba maple). *Populus deltoides* (plains cottonwood) may dominate seral stands of this type. In sharply cut, V-shaped ravines, the largest trees are near the centre or bottom of the ravines where there is more soil moisture and protection from drying wind.

In relatively undisturbed late seral to climax stands, the undergrowth is comprised of two layers. The taller and more conspicuous shrub layer (2 to 3 m [6-10 ft] in height) is dominated by *Prunus virginiana* (choke cherry). Associated shrubs may include *Amelanchier alnifolia* (Saskatoon), *Cornus stolonifera* (red-osier dogwood), and *Ribes* species (currants and gooseberries). The second (lower) layer is dominated by herbaceous species such as *Carex sprengelii* (Sprengel's sedge), *Elymus virginicus* (Virginia wild rye), *Thalictrum* species (meadow rue), *Viola canadensis* (western Canada violet), and *Smilacina stellata* (star-flowered Solomon's-seal) (Table 4).

Table 4. Average canopy cover, range of canopy cover, and constancy for species recorded in 10 late seral to climax stands of the *Acer negundo/Prunus virginiana* (Manitoba maple/choke cherry) habitat type

TABLE 4.	**% Can. Cov.**		
Species	**Avg.**	**Rng.**	**Con.**
Trees			
Acer negundo (Manitoba maple)	82	60-98	100
Fraxinus pennsylvanica (green ash)	2	0-3	20

TABLE 4.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Populus balsamifera (balsam poplar)	1	0-1	10
Populus tremuloides (aspen)	10	0-10	10
Shrubs			
Amelanchier alnifolia (Saskatoon)	7	0-10	40
Cornus stolonifera (red-osier dogwood)	5	0-10	50
Corylus cornuta (beaked hazelnut)	1	0-1	10
Crataegus rotundifolia (round-leaved hawthorn)	3	0-3	10
Prunus virginiana (choke cherry)	27	0-60	90
Rhus radicans (poison ivy)	3	0-3	10
Ribes americanum (wild black currant)	7	0-10	20
Ribes lacustre (bristly black currant)	4	0-10	30
Ribes oxyacanthoides (northern gooseberry)	2	0-3	40
Rosa spp. (rose)	2	0-3	50
Rubus idaeus (wild red raspberry)	5	0-10	30
Salix petiolaris (basket willow)	3	0-3	10
Symphoricarpos occidentalis (buckbrush)	7	0-20	90
Viburnum opulus (high-bush cranberry)	10	0-10	10
Graminoids			
Agropyron pectiniforme (crested wheat grass)	1	0-1	10
Agropyron smithii (western wheat grass)	22	0-40	20
Agrostis stolonifera (redtop)	1	0-1	10
Agropyron trachycaulum (slender wheat grass)	10	0-10	10
Bromus inermis (awnless brome)	17	0-30	60
Carex aquatilis (water sedge)	1	0-1	10
Carex athrostachya (long-bracted sedge)	10	0-10	10
Carex sprengelii (Sprengel's sedge)	25	0-40	50
Cinna latifolia (drooping wood-reed)	10	0-10	10
Elymus virginicus (Virginia wild rye)	14	0-30	60
Phalaris arundinacea (reed canary grass)	30	0-30	10
Poa pratensis (Kentucky bluegrass)	2	0-3	40
Trisetum cernuum (nodding trisetum)	3	0-3	10
Forbs			
Actaea rubra (red and white baneberry)	7	0-10	20
Anemone cylindrica (long-fruited anemone)	5	0-10	30

TABLE 4.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Aralia nudicaulis (wild sarsaparilla)	42	0-80	20
Artemisia absinthium (absinthe wormwood)	1	0-1	10
Aster hesperius (western willow aster)	1	0-1	10
Atriplex prostrata (prostrate saltbush)	3	0-3	10
Botrychium virginianum (Virginia grape fern)	1	0-1	10
Carduus nutans (nodding thistle)	1	0-1	10
Chenopodium fremontii (Fremont's goosefoot)	10	0-10	10
Chenopodium rubrum (red goosefoot)	1	0-1	10
Chenopodium salinum (oak-leaved goosefoot)	1	0-1	10
Cirsium arvense (Canada thistle)	1	0-1	10
Disporum trachycarpum (fairybells)	1	0-1	20
Galium boreale (northern bedstraw)	5	0-10	20
Galium trifidum (small bedstraw)	5	0-10	30
Galium triflorum (sweet-scented bedstraw)	2	0-3	40
Geranium richardsonii (wild white geranium)	1	0-1	20
Hackelia americana (nodding stickseed)	1	0-1	10
Heracleum lanatum (cow parsnip)	5	0-10	30
Lappula squarrosa (bluebur)	3	0-3	10
Osmorhiza chilensis (blunt-fruited sweet cicely)	1	0-1	10
Sanicula marilandica (snakeroot)	2	0-3	20
Sium suave (water parsnip)	1	0-1	10
Smilax herbacea (Carrion flower)	1	0-3	50
Smilacina stellata (star-flowered Solomon's-seal)	4	0-10	40
Solidago canadensis (Canada goldenrod)	5	0-10	30
Solidago missouriensis (low goldenrod)	1	0-1	10
Sonchus arvensis (perennial sow-thistle)	1	0-1	20
Stachys palustris (marsh hedge-nettle)	3	0-3	10
Taraxacum officinale (common dandelion)	5	0-10	20
Thalictrum occidentale (western meadow rue)	1	0-1	10
Thalictrum venulosum (veiny meadow rue)	12	0-50	60
Urtica dioica (common nettle)	3	0-3	50

TABLE 4.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Viola canadensis (western Canada violet)	8	0-20	60

SUCCESSIONAL INFORMATION

Primary Successional Stages

Primary successional stages of the *Acer negundo/Prunus virginiana* (Manitoba maple/choke cherry) habitat type may be a variety of types, but most commonly are communities dominated by cottonwoods or *Salix exigua* (sandbar willow).

Early Seral Stage—An early seral stage on a primary successional site, such as a recently deposited alluvial bar, may support the *Populus deltoides*/Recent Alluvial Bar (plains cottonwood/Recent Alluvial Bar) community type.

Mid-Seral Stage—Through time under limited disturbance, the stand will progress to a mature stand of *Populus deltoides* (plains cottonwood) representing the *Populus deltoides/Cornus stolonifera* (plains cottonwood/red-osier dogwood) community type. Normally, the understory of a pole to mature *Populus deltoides* (plains cottonwood) stand becomes dominated by *Acer negundo* (Manitoba maple). As the *Populus deltoides* (plains cottonwood) overstory matures, opens up, and finally becomes decadent, the *Acer negundo* (Manitoba maple) is ready to replace it.

Late Seral to Climax (PNC) Stage—As a cottonwood stand dies, primary succession toward other communities will occur unless the riverine process of flooding deposits new sediments suitable for cottonwood seedling establishment. In the absence of such sediment deposition, primary succession will continue from the *Populus deltoides/Cornus stolonifera* (plains cottonwood/red-osier dogwood) community type toward the *Acer negundo/Prunus virginiana* (Manitoba maple/choke cherry) habitat type.

Secondary Successional Stages

Late Seral to Climax (PNC) Stage—The presence or absence of a particular understory community may aid in determining the degree of disturbance (both present and historical disturbance) on a site. In relatively undisturbed stand of the climax community of this type, the understory consists of two layers. *Prunus virginiana* (choke cherry), *Amelanchier alnifolia* (Saskatoon), and *Ribes* species (currants and gooseberries) dominate a tall shrub layer (2-3 m [6-10 ft] in height). *Carex sprengelii* (Sprengel's sedge), *Galium boreale* (northern bedstraw), *Smilacina stellata* (star-flowered Solomon's-seal), and *Thalictrum species* (meadow rue) dominate a lower, herbaceous layer. Relatively undisturbed stands will have all age classes of tree species present (seedlings, saplings, pole, and mature).

Mid-Seral Stage—Maintaining even moderate levels of grazing can sharply reduce regeneration of trees. Sapling and pole size trees will begin to show signs of damage. Reducing seedling and sapling age classes of the overstory tree species will cause a decline of the tree population. If a moderate to heavy level of disturbance is continued over an extended period, the trees will eventually be eliminated from the site.

In addition to its impact on the tree layer, grazing greatly reduces both abundance and canopy cover of the understory layer of desirable shrubs and herbaceous species. Less desirable species such as *Symphoricarpos occidentalis* (buckbrush), *Rosa woodsii* (common wild rose), *Crataegus rotundifolia* (round-leaved hawthorn), *Bromus inermis* (awnless brome) and *Poa pratensis* (Kentucky bluegrass) will invade the stand.

Under heavy grazing pressure, tree reproduction is severely restricted or eliminated. At this stage, most tree saplings and pole sizes have been eliminated by trampling and/or rubbing, or browsed until dead. High levels of grazing cause the stand to open up, allowing sun tolerant, less desirable species such as *Symphoricarpos occidentalis* (buckbrush), *Rosa woodsii* (common wild rose), *Crataegus rotundifolia* (round-leaved hawthorn), *Poa pratensis* (Kentucky bluegrass), and *Bromus inermis* (awnless brome) to dominate (Table 5). Many sites supporting the *Acer negundo/Prunus virginiana* (Manitoba maple/choke cherry) habitat type in the northern Great Plains are in this state, or in the severely overgrazed state (discussed in the following paragraph).

Early Seral Stage—Prolonged periods of severe overgrazing result in a stand of older decadent trees with a very open understory. This understory may be so severely altered that most of even the less desirable species, such as *Symphoricarpos occidentalis* (buckbrush), *Rosa* species (rose), *Crataegus rotundifolia* (round-leaved hawthorn), and *Poa pratensis* (Kentucky bluegrass) are eliminated leaving large areas of exposed soil. When a stand is at this stage, the prospect of returning the site to its former state is very difficult, if not impossible. Restoration would be extremely expensive. Therefore, if a manager wants to maintain the trees, the most cost effective way is to change management ***BEFORE*** the site is too degraded.

Severely disturbed *Acer negundo/Prunus virginiana* (Manitoba maple/choke cherry) sites may be dominated by the *Shepherdia argentea* (thorny buffaloberry), *Crataegus rotundifolia* (round-leaved hawthorn), *Rosa woodsii* (common wild rose), or the *Symphoricarpos occidentalis* (buckbrush) community types. Close observation of any remnant woody species, such as *Acer negundo*, (Manitoba maple) will aid in determination of site potential. On sites released from grazing, the *Acer negundo/Prunus virginiana* (Manitoba maple/choke cherry) habitat type may re-establish in areas presently dominated by *Symphoricarpos occidentalis* (buckbrush) community type, *Agropyron smithii* (western wheat grass) habitat type, and some wetter sites of the *Artemisia cana/Agropyron smithii* (silver sagebrush/western wheat grass) habitat type.

Table 5. Average canopy cover, range of canopy cover, and constancy for species recorded in 25 disturbed and/or early to mid-seral stands of the *Acer negundo/Prunus virginiana* (Manitoba maple/choke cherry) habitat type

TABLE 5.	**% Can. Cov.**		
Species	**Avg.**	**Rng.**	**Con.**
Trees			
Acer negundo (Manitoba maple)	59	20-98	100
Fraxinus pennsylvanica (green ash)	1	0-1	8
Populus balsamifera (balsam poplar)	70	0-70	4
Populus deltoides (plains cottonwood)	68	0-90	16
Populus tremuloides (aspen)	20	0-20	4
Ulmus americana (American elm)	20	0-20	4
Shrubs			
Amelanchier alnifolia (Saskatoon)	1	0-3	24
Artemisia cana (silver sagebrush)	3	0-3	4
Betula occidentalis (water birch)	40	0-40	4
Clematis ligusticifolia (western clematis)	2	0-3	8
Clematis occidentalis (purple clematis)	3	0-3	4
Cornus stolonifera (red-osier dogwood)	13	0-40	44
Corylus cornuta (beaked hazelnut)	1	0-1	4
Lonicera involucrata (bracted honeysuckle)	10	0-10	4
Prunus americana (wild plum)	12	0-20	8
Prunus pensylvanica (pin cherry)	10	0-10	4
Prunus virginiana (choke cherry)	19	0-50	64
Rhus radicans (poison ivy)	3	0-3	4
Ribes americanum (wild black currant)	2	0-3	12
Ribes aureum (golden currant)	8	0-20	12
Ribes lacustre (bristly black currant)	10	0-10	4

TABLE 5.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Ribes oxyacanthoides (northern gooseberry)	10	0-20	12
Ribes spp. (currant)	2	0-3	12
Ribes triste (wild red currant)	10	0-10	4
Rosa woodsii (common wild rose)	31	0-80	44
Rosa spp. (rose)	6	0-10	24
Rubus idaeus (wild red raspberry)	3	0-3	8
Salix amygdaloides (peach-leaved willow)	40	0-60	8
Salix exigua (sandbar willow)	7	0-10	8
Salix lutea (yellow willow)	23	0-40	12
Symphoricarpos occidentalis (buckbrush)	19	0-60	56
Graminoids			
Agropyron repens (quack grass)	20	0-20	4
Agropyron smithii (western wheat grass)	28	0-40	24
Agrostis stolonifera (redtop)	2	0-3	8
Bromus inermis (awnless brome)	36	0-90	60
Bromus japonicus (Japanese chess)	10	0-20	12
Bromus tectorum (downy chess)	11	0-20	12
Carex pensylvanica (sun-loving sedge)	1	0-1	4
Carex sprengelii (Sprengel's sedge)	42	0-80	8
Carex spp. (sedge)	60	0-60	4
Elymus glaucus (smooth wild rye)	1	0-1	4
Elymus virginicus (Virginia wild rye)	40	0-70	12
Hordeum jubatum (foxtail barley)	20	0-20	4
Muhlenbergia racemosa (marsh muhly)	40	0-40	4
Phalaris arundinacea (reed canary grass)	3	0-3	4
Phleum pratense (timothy)	20	0-20	4
Poa bulbosa (Bulbous Bluegrass)	30	0-30	4
Poa palustris (fowl bluegrass)	3	0-3	4
Poa pratensis (Kentucky bluegrass)	13	0-40	28
Stipa comata (needle-and-thread)	14	0-20	12
Forbs			
Achillea millefolium (common yarrow)	1	0-3	12
Actaea rubra (red and white baneberry)	10	0-10	4
Ambrosia trifida (great ragweed)	1	0-1	4
Anemone cylindrica (long-fruited anemone)	3	0-3	4
Apocynum spp. (dogbane)	1	0-1	4
Aralia nudicaulis (wild sarsaparilla)	20	0-20	4
Arctium lappa (great burdock)	1	0-1	8
Arctium minus (common burdock)	23	0-40	16
Artemisia campestris (plains wormwood)	1	0-1	4
Asclepias speciosa (showy milkweed)	2	0-3	8
Asperugo procumbens (madwort)	40	0-40	4
Aster ciliolatus (Lindley's aster)	1	0-1	4
Aster hesperius (western willow aster)	10	0-10	4
Aster spp. (aster)	1	0-1	4
Camelina microcarpa (small-seeded false flax)	1	0-1	4
Campanula rotundifolia (harebell)	10	0-10	4
Chenopodium fremontii (Fremont's goosefoot)	1	0-1	4
Chenopodium salinum (oak-leaved goosefoot)	30	0-30	4
Cicuta maculata (water-hemlock)	1	0-1	8
Cirsium arvense (Canada thistle)	7	0-20	28
Cirsium vulgare (bull thistle)	1	0-1	4
Collomia linearis (narrow-leaved collomia)	10	0-10	4
Convolvulus sepium (wild morning-glory)	1	0-1	4
Cynoglossum officinale (hound's-tongue)	2	0-3	8
Descurainia sophia (flixweed)	1	0-1	4
Echinocystis lobata (wild cucumber)	3	0-3	4
Unknown Forb	1	0-1	8
Fragaria virginiana (wild strawberry)	1	0-1	4
Galeopsis tetrahit (hemp-nettle)	3	0-3	4
Galium boreale (northern bedstraw)	3	0-3	4
Galium triflorum (sweet-scented bedstraw)	4	0-10	16
Geum macrophyllum (large-leaved yellow avens)	1	0-1	8
Glycyrrhiza lepidota (wild licorice)	5	0-10	16
Grindelia squarrosa (gumweed)	10	0-10	4
Heracleum lanatum (cow parsnip)	37	0-70	8
Humulus lupulus (common hop)	10	0-20	8
Lactuca serriola (prickly lettuce)	20	0-20	4
Lappula squarrosa (bluebur)	1	0-1	4
Lathyrus ochroleucus (cream-colored vetchling)	3	0-3	4
Lepidium spp. (pepper-cress)	10	0-10	4
Maianthemum canadense (wild lily-of-the-valley)	1	0-1	4
Medicago lupulina (black medick)	1	0-1	4
Melilotus alba (white sweet-clover)	1	0-1	4

TABLE 5.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Melilotus officinalis (yellow sweet-clover)	10	0-10	4
Mentha arvensis (wild mint)	4	0-10	12
Mertensia spp. (bluebell)	10	0-10	4
Nepeta cataria (catnip)	1	0-3	12
Osmorhiza chilensis (blunt-fruited sweet cicely)	2	0-3	8
Plantago major (common plantain)	1	0-1	4
Polygonum amphibium (water smartweed)	1	0-1	4
Potentilla spp. (cinquefoil)	1	0-1	4
Rumex crispus (curled dock)	3	0-3	4
Saussurea americana (American saw-wort)	3	0-3	4
Sisymbrium loeselii (tall hedge mustard)	1	0-1	4
Smilax herbacea (Carrionflower)	2	0-3	8
Smilacina stellata (star-flowered Solomon's-seal)	3	0-10	20
Solidago canadensis (Canada goldenrod)	7	0-20	24
Sonchus arvensis (perennial sow-thistle)	5	0-10	8
Stachys palustris (marsh hedge-nettle)	1	0-1	4
Taraxacum officinale (common dandelion)	1	0-3	24
Thalictrum occidentale (western meadow rue)	1	0-1	4
Thalictrum venulosum (veiny meadow rue)	9	0-30	20
Thlaspi arvense (stinkweed)	3	0-3	4
Urtica dioica (common nettle)	3	0-10	40
Vicia americana (wild vetch)	1	0-1	12
Viola canadensis (western Canada violet)	3	0-3	12
Ferns and Allies			
Equisetum hyemale (common scouring-rush)	1	0-1	4

SOILS

Flooding is generally infrequent on sites occupied by *Acer negundo* (Manitoba maple), but the species is very tolerant of flooding. Soils are typically Regosols or Chernozems. Textures range from clay loam to sandy loam. Water tables are generally near the soil surface in spring or after storm events but commonly fall below 1 m (39 in) during dry periods.

ADJACENT COMMUNITIES

Adjacent drier sites are dominated by the *Artemisia cana/Agropyron smithii* (silver sagebrush/western wheat grass) habitat type, the *Bromus inermis* (awnless brome) community type, or by a variety of upland species. Wetter sites may be dominated by *Typha latifolia* (common cattail), *Scirpus* species (bulrush), or *Eleocharis* species (spike rush).

MANAGEMENT INFORMATION

Livestock

If the long-term management objective is maintenance of the tree stand, then managers need to key on the seedling reproduction of *Acer negundo* (Manitoba maple), or the stand will eventually be eliminated.

On relatively undisturbed sites, dense stands of the *Acer negundo/Prunus virginiana* (Manitoba maple/choke cherry) habitat type limit access by livestock by their understory density. As the stands open up, livestock access will increase. Valuable benefits this habitat type provides to livestock producers are: 1) shade, 2) water source, 3) palatable forage, 4) protection from seasonal storms, and 5) calving grounds. Because the *Acer negundo/Prunus virginiana* (Manitoba maple/choke cherry) habitat type covers a small portion of the landscape, and because of its high wildlife value (see the Wildlife section), these sites may become focal points of conflict between livestock and wildlife management.

Livestock producers should reduce or eliminate hot season use in this type. This can be accomplished by placing salt on the uplands away from wooded areas, by removing water sources from wooded areas, and in some cases, by using cross fencing (drift fencing) placed perpendicular to the long axis of the stand at appropriate distance intervals. This method is most appropriate for stands located in V-shaped draws or ravines. These short fences will prevent livestock from trailing down the middle of the stand. On disturbed sites, it may be necessarily to fence out an area for five or more years in order to allow regeneration of trees and shrubs. After the goal of regeneration is reached on one area, a different portion of the stand may be fenced out.

The use of these sites as winter feeding grounds can have mixed results. In some cases, proper winter use will have little impacts on the stand. However, if livestock numbers are high, trampling and rubbing can have a detrimental impact on the woody plants. If livestock use is high when the frost is going out of the ground, a great deal of churning and compaction can occur on the soft soil.

Over the years, there has been some debate whether *Prunus virginiana* (choke cherry) leaves are poisonous to livestock. The leaves and seeds have sugars that contain cyanide. These cyanide sugars are not directly poisonous, but when the plant material is chewed and digested, enzymes cause the release of hydrogen cyanide (Ode Pers. Comm. 1987). In high concentrations, hydrogen cyanide is a metabolic poison to most animals. It has recently been shown that livestock can acquire the ability to detoxify hydrogen cyanide by consuming small amounts of it over an extended period. Therefore, *Prunus virginiana* (choke cherry) will poison livestock only if consumed in large quantity without prior conditioning.

High values associated with the *Acer negundo/Prunus virginiana* (Manitoba maple/choke cherry) habitat type should elicit special consideration by livestock producers.

Wildlife

In the Prairie Ecozone, woody draws are very important to wildlife, even though they represent a very small fraction of total area (about 1-2 percent). Situated to collect more moisture than normal incident precipitation, these draws are more productive than the surrounding uplands (Thomas and others 1979). Woody draws offer wildlife thermal cover, nesting habitat, a water source, summer and winter forage, secure travel corridors, and hiding cover (Ames 1977, Hansen and others 1984, Hansen and Hoffman 1988, Severson and Boldt 1978). Woody draws are important year round habitat for mule deer, provide critical winter habitat for whitetail deer (Severson and Carter 1978, Swenson 1981), and serve as fawning areas for whitetail and mule deer. During fall and winter, these woody draws also provide critical habitat for sharptailed grouse.

Woody draws provide essential habitat for a large number of nongame wildlife species. Grosz and others (1981) found that woody draws are the centre of activity for most species and are critically important to many species during the stressful winter months. They also found that, in comparison to adjacent uplands, these sites support a greater diversity and density of birds. In northwestern North Dakota, Hopkins (1985) counted bird species nesting in woody draws, and found that, although it had lower species diversity than cottonwood forests, the *Acer negundo/Prunus virginiana* (Manitoba maple/choke cherry) habitat type supported a much higher density of breeding pairs. Finally, these woody draws provide important habitat for coyote, weasel, bobcat, and red fox (Swenson 1981, Sieg and others 1985).

If the long-term management objective is to maintain trees on the site, then managers need to key on regeneration of the tree species, or the stand will eventually be eliminated.

Fisheries

The woody species associated with the *Acer negundo/Prunus virginiana* (Manitoba maple/choke cherry) habitat type provide important streambank stability, thermal cover, and nutrients.

Fire

Acer negundo (Manitoba maple) and most of the important shrub species in the *Acer negundo/Prunus virginiana* (Manitoba maple/choke cherry) habitat type produce sprouts from the root crown when the main trunk is damaged. The fact that these woody species can to sprout prolifically suggests that this habitat type is adapted to fire and perhaps to periodic stand regeneration by fire. However, the role of fire in this habitat type is still not well understood.

Soil Management and Rehabilitation Opportunities

Sites adjacent to streams are extremely vulnerable to bank sloughing, particularly when soils are moist. Excessive livestock presence will increase soil compaction and decrease stability and water holding capacity. Management should emphasize the importance of maintaining understory shrubs.

Where revegetation with woody species is desired, *Acer negundo* (Manitoba maple), *Prunus virginiana* (choke cherry), *Amelanchier alnifolia* (Saskatoon), and *Ribes* species (currants and gooseberries) are well adapted to planting on disturbed sites. Rooted cuttings or nursery grown seedlings are easily established on moist, well-drained soils. Growth rates are usually moderate to rapid, and the roots of established seedlings become effective stabilizers of alluvial deposits.

Recreational Uses and Considerations

Recreational developments and transportation corridors are common in this type due to its proximity to streams. Recreational opportunities are excellent for fishing, hunting, and observing a variety of bird species.

The fruit of *Prunus virginiana* (choke cherry) is highly regarded for making wine and jelly, but one must harvest ahead of the birds (Johnson and Nichols 1982). Aboriginal people ate the fruit fresh or preserved it by drying. They also combined it with venison and buffalo meat to make mincemeat, and they used the berries for medicinal purposes.

Care must be taken when locating structures within this type. Some campgrounds and structures have been seriously damaged by floods, or lost altogether.

OTHER STUDIES

Hansen and others (1995) describe this habitat type for the northern Great Plains in eastern Montana. Lawrence and Romo (1994) described an *Acer negundo* (Manitoba maple) community type on the Matador Research Station in southwestern Saskatchewan.

Fraxinus pennsylvanica/Prunus virginiana Habitat Type

(Green Ash/Choke Cherry Habitat Type)

FRAXPEN/PRUNVIR
Number of Stands Sampled = 86
Number of Stands Sampled in Saskatchewan = 10

LOCATION AND ASSOCIATED LANDFORMS

The *Fraxinus pennsylvanica/Prunus virginiana* (green ash/choke cherry) habitat type is a minor type in the Saskatchewan Prairie Ecozone. This habitat type occurs along streams, rivers, lakes, springs, and ponds in the region, occupying either terraces, fans, or floodplain positions. It also occupies V-shaped ravines where sites may be occasionally flooded by overland flows.

In the Prairie Ecozone of Canada, where the brown and dark brown soils of the Chernozemic order usually support grassland or shrubland vegetation, taller woodland vegetation is generally confined to stream courses or other landscape positions where landform and topography permit accumulation of moisture in excess of local incident precipitation (Hansen and Hoffman 1988). Sites can be found on higher (older) terraces of the South Saskatchewan, Souris, and Qu'Appelle Rivers.

VEGETATION

The tree layer of the *Fraxinus pennsylvanica/Prunus virginiana* (green ash/choke cherry) habitat type may include *Acer negundo* (Manitoba maple) and *Ulmus americana* (American elm). However, Dutch elm disease has had a detrimental impact on *Ulmus americana* (American elm) and the future of *Ulmus americana* (American elm) in Saskatchewan is questionable. *Populus deltoides* (plains cottonwood) may dominate seral stands of this type. In sharply cut, V-shaped ravines, the largest trees are near the centre or bottom of the ravines where there is greater soil moisture.

In relatively undisturbed late seral to climax stands, the undergrowth is comprised of two layers. The taller and more conspicuous shrub layer (2-3 m [6.5-9.8 ft] in height) is dominated by *Prunus virginiana* (choke cherry). Associated shrubs may include *Prunus americana* (wild plum) and *Amelanchier alnifolia* (Saskatoon). The second layer is dominated by herbaceous species such as *Carex sprengelii* (Sprengel's sedge), *Elymus virginicus* (Virginia wild rye), and *Thalictrum species* (meadow rue) (Table 6).

Table 6. Average canopy cover, range of canopy cover, and constancy for species recorded in 15 late seral to climax stands of the *Fraxinus pennsylvanica/Prunus virginiana* (green ash/choke cherry) habitat type

TABLE 6.	**% Can. Cov.**		
Species	**Avg.**	**Rng.**	**Con.**
Trees			
Acer negundo (Manitoba maple)	27	0-90	53
Betula papyrifera (white birch)	1	0-1	7
*Fraxinus pennsylvanica*green ash)	63	10-80	100
Populus tremuloides (aspen)	10	0-10	7
Ulmus americana (American elm)	11	0-40	27
Shrubs			
Amelanchier alnifolia (Saskatoon)	8	0-20	40
Amelanchier sanguinea (eastern serviceberry)	2	0-3	13
*Clematis ligusticifolia*western clematis)	1	0-1	7
*Cornus stolonifera*red-osier dogwood)	4	0-10	33
*Corylus cornuta*beaked hazelnut)	20	0-30	13
*Crataegus rotundifolia*round-leaved hawthorn)	2	0-3	33
Juniperus communis (ground juniper)	3	0-3	7
Juniperus scopulorum (Rocky Mountain juniper)	3	0-3	7
Lonicera tatarica (tatarian honeysuckle)	1	0-1	7
Parthenocissus inserta (large tooth Virginia creeper)	1	0-1	13
Prunus americana (Wild Plum)	12	0-20	13
Prunus virginiana (choke cherry)	52	0-80	87
Rhus radicans (poison ivy)	7	0-20	27
Rhus trilobata (skunkbush)	1	0-1	7
Ribes americanum (wild black currant)	9	0-20	27
Ribes aureum (golden currant)	1	0-3	20
Ribes oxyacanthoides (northern gooseberry)	7	0-20	20
Ribes spp. (currant)	2	0-3	27
Rosa spp. (rose)	4	0-20	60
Rubus pubescens (dewberry)	3	0-3	7
Salix bebbiana (beaked willow)	3	0-3	7
Symphoricarpos occidentalis (buckbrush)	8	0-20	87
Viburnum opulus (high-bush cranberry)	3	0-3	7
Graminoids			
Agropyron pectiniforme (crested wheat grass)	1	0-1	7
Agropyron smithii (western wheat grass)	3	0-3	7
Agropyron trachycaulum (slender wheat grass)	2	0-3	20
Beckmannia syzigachne (slough grass)	1	0-1	7
Bromus inermis (awnless brome)	20	0-40	40
Bromus tectorum (downy chess)	3	0-3	7
Carex bebbii (Bebb's sedge)	10	0-10	7
Carex sprengelii (Sprengel's sedge)	36	0-60	67
Carex vesicaria (blister sedge)	10	0-10	7
Carex spp. (sedge)	3	0-3	7

TABLE 6.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Elymus canadensis (Canada wild rye)	20	0-20	7
Elymus virginicus (Virginia wild rye)	26	0-80	40
Oryzopsis micrantha (little-seed rice grass)	2	0-3	13
Phalaris arundinacea (reed canary grass)	10	0-10	7
Poa compressa (Canada bluegrass)	3	0-3	7
Poa palustris (fowl bluegrass)	3	0-3	13
Poa pratensis (Kentucky bluegrass)	12	0-20	47
Forbs			
Achillea millefolium (common yarrow)	1	0-1	13
Actaea rubra (red and white baneberry)	10	0-10	7
Anemone cylindrica (long-fruited anemone)	2	0-3	20
Aralia nudicaulis (wild sarsaparilla)	27	0-40	20
Artemisia absinthium (absinthe wormwood)	3	0-3	7
Artemisia ludoviciana (prairie sagewort)	1	0-1	7
Aster hesperius (western willow aster)	1	0-1	13
Aster spp. (aster)	3	0-3	7
Atriplex prostrata (prostrate saltbush)	3	0-3	7
Bidens cernua (nodding beggarticks)	3	0-3	7
Campanula rotundifolia (harebell)	1	0-1	7
Chenopodium fremontii (Fremont's goosefoot)	3	0-3	7
Chenopodium salinum (oak-leaved goosefoot)	1	0-1	7
Cicuta maculata (water-hemlock)	1	0-1	13
Cirsium arvense (Canada thistle)	1	0-1	7
Convolvulus arvensis (field bindweed)	1	0-1	7
Cynoglossum officinale (hound's-tongue)	1	0-1	7
Cystopteris fragilis (fragile bladder fern)	20	0-20	7
Disporum trachycarpum (fairybells)	1	0-1	27
Unknown Forb	1	0-1	13
Fragaria vesca (woodland strawberry)	3	0-3	7
Fragaria virginiana (wild strawberry)	2	0-3	20
Galium aparine (cleavers)	2	0-3	20
Galium boreale (northern bedstraw)	6	0-20	60
Galium triflorum (sweet-scented bedstraw)	4	0-10	27
Hackelia americana (nodding stickseed)	2	0-3	13
Heracleum lanatum (cow parsnip)	10	0-10	7
Heuchera richardsonii (Richardson's alumroot)	2	0-3	13
Hieracium umbellatum (narrow-leaved hawkweed)	10	0-10	7
Humulus lupulus (common hop)	3	0-3	7
Lappula squarrosa (bluebur)	1	0-1	7
Lysimachia ciliata (fringed loosestrife)	10	0-10	7
Mentha arvensis (wild mint)	1	0-1	7
Mentha spp. (mint)	3	0-3	7
Monarda fistulosa (wild bergamot)	2	0-3	13
Nepeta cataria (catnip)	1	0-1	7
Osmorhiza chilensis (blunt-fruited sweet cicely)	1	0-3	27
Osmorhiza longistylis (smooth sweet cicely)	3	0-3	7
Parietaria pensylvanica (American pellitory)	1	0-1	7
Petasites vitifolius (vine-leaved coltsfoot)	3	0-3	7
Pyrola asarifolia (common pink wintergreen)	1	0-1	7
Sanicula marilandica (snakeroot)	12	0-20	27
Saxifraga spp. (saxifrage)	1	0-1	7
Saxifraga nelsoniana (Nelson's saxifrage)	1	0-1	7
Scutellaria galericulata (marsh skullcap)	3	0-3	7
Sium suave (water parsnip)	3	0-3	7
Smilax herbacea (Carrion flower)	1	0-3	33
Smilacina stellata (star-flowered Solomon's-seal)	6	0-20	47
Solidago canadensis (Canada goldenrod)	1	0-3	20
Solidago missouriensis (low goldenrod)	3	0-3	7
Sonchus arvensis (perennial sow-thistle)	1	0-1	7
Streptopus amplexifolius (clasping-leaved twisted-stalk)	20	0-20	7
Taraxacum officinale (common dandelion)	1	0-3	27
Thalictrum dasycarpum (tall meadow rue)	2	0-3	33

TABLE 6.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Thalictrum venulosum (veiny meadow rue)	6	0-20	40
Urtica dioica (common nettle)	3	0-3	7
Vicia americana (wild vetch)	1	0-1	7
Viola spp. (violet)	3	0-3	7
Viola canadensis (western Canada violet)	8	0-20	47
Viola renifolia (kidney-leaved violet)	1	0-1	7
Ferns and Allies			
Equisetum arvense (common horsetail)	3	0-3	7

SUCCESSIONAL INFORMATION

Primary Successional Stages

Primary successional stages of the *Fraxinus pennsylvanica/Prunus virginiana* (green ash/choke cherry) habitat type may be dominated by a variety of types including cottonwoods, *Salix exigua* (sandbar willow), or *Salix amygdaloides* (peach-leaved willow) community types.

Early Seral Stage—An early seral stage on a primary successional site, such as a recently deposited alluvial bar, may contain the *Populus deltoides*/Recent Alluvial Bar (plains cottonwood/Recent Alluvial Bar) community type.

Mid-Seral Stage—Through time under limited disturbance, the stand progresses to a mature stand of *Populus deltoides* (plains cottonwood) representing the *Populus deltoides/Cornus stolonifera* (plains cottonwood/red-osier dogwood) community type. Normally, the understory of a pole to mature *Populus deltoides* (plains cottonwood) stand is dominated by *Fraxinus pennsylvanica* (green ash). As the *Populus deltoides* (plains cottonwood) overstory matures, becomes more open, and finally, becomes decadent, *Fraxinus pennsylvanica* (green ash) is ready to replace them.

Late Seral to Climax (PNC) Stage—As the cottonwood stand dies, primary succession toward other communities will occur unless flooding deposits new sediments suitable for cottonwood seedlings. In the absence of sediment deposition, primary succession can continue from the *Populus deltoides/Cornus stolonifera* (plains cottonwood/red-osier dogwood) community type to the *Fraxinus pennsylvanica/Prunus virginiana* (green ash/choke cherry) habitat type.

Secondary Successional Stages

Late Seral to Climax (PNC) Stage—The presence or absence of a particular understory community may aid in determining the degree of disturbance (both present and historical disturbance) on a particular site. In relatively undisturbed stands (e.g., climax plant community), the undergrowth of the *Fraxinus pennsylvanica/Prunus virginiana* (green ash/choke cherry) habitat type is comprised of two layers. *Prunus virginiana* (choke cherry), *Amelanchier alnifolia* (Saskatoon), and *Ribes* species (currants and gooseberries) dominate the taller and more conspicuous shrub layer (2-3 m [6.5-9.8 ft] in height). Herbaceous species such as *Carex sprengelii* (Sprengel's sedge), *Galium boreale* (northern bedstraw), *Smilacina stellata* (star-flowered Solomon's-seal), and *Thalictrum* species (meadow rue) dominate the second layer. Relatively undisturbed stands will have all age groups of tree species present (seedlings, saplings, pole, and mature).

Mid-Seral Stage—Maintaining moderate levels of grazing sharply reduces reproduction of tree species. Many of the sapling and pole size trees begin to show signs of damage. Reducing the seedling and sapling stages of the overstory tree species will eventually result in a decline of the tree population. If the degree of disturbance continues over an extended period, the trees will eventually be eliminated from the site.

In addition to its impact on the tree layer, grazing greatly reduces both the abundance and canopy cover of the understory layer of the desirable shrub and herbaceous species. Less desirable species such as *Symphoricarpos occidentalis* (buckbrush), *Rosa woodsii* (common wild rose), *Elaeagnus commutata* (silverberry), *Crataegus rotundifolia* (round-leaved hawthorn), *Poa pratensis* (Kentucky bluegrass), *Bromus inermis* (awnless brome), begin to invade the stand.

Under heavy grazing pressures, tree reproduction is either severely restricted or eliminated. At this stage, most of the saplings and pole-sized trees have either been eliminated by trampling and/or rubbing, or browsed back until they are dead. High levels of grazing cause the stand to open up allowing the more sun tolerant, less desirable species such as *Symphoricarpos occidentalis* (buckbrush), *Rosa woodsii* (common wild rose), *Crataegus rotundifolia* (round-leaved hawthorn), *Bromus inermis* (awnless brome), and *Poa pratensis* (Kentucky bluegrass) to dominate. In fact, many of the sites that support the *Fraxinus pennsylvanica/Prunus virginiana* (green ash/choke cherry) habitat type in the northern Great Plains are in this state or in the severe overgrazed state (discussed in the following paragraph).

Early Seral Stage—Prolonged periods of severe overgrazing result in a stand of only older, decadent trees and a very open understory. The understory may be so severely impacted that most of the less desirable species such as *Symphoricarpos occidentalis* (buckbrush), *Rosa woodsii* (common wild rose), *Crataegus rotundifolia* (round-leaved hawthorn), *Bromus inermis* (awnless brome) and *Poa pratensis* (Kentucky bluegrass) are also eliminated resulting in large amounts of exposed soil. When a stand is at this stage, the prospect of returning the site to its former state is very difficult if not impossible. (Restoration would be extremely expensive in terms of both labour and money.) Therefore, if a manager wants to maintain the stand of trees, the most cost effective method is to change the management on the site ***BEFORE*** the site is too degraded.

Severely disturbed *Fraxinus pennsylvanica/Prunus virginiana* (green ash/choke cherry) sites may be dominated by the *Shepherdia argentea* (thorny buffaloberry), *Crataegus rotundifolia* (round-leaved hawthorn), *Rosa woodsii* (common wild rose), or the *Symphoricarpos occidentalis* (buckbrush) community types. Close observation of remnant species, such as *Fraxinus pennsylvanica* (green ash) will aid in determination of the site potential.

Table 7 shows the average canopy cover, range of canopy cover, and constancy for species recorded in disturbed and/or early to mid-seral stands of the *Fraxinus pennsylvanica/Prunus virginiana* (green ash/choke cherry) habitat type.

Table 7 Average canopy cover, range of canopy cover, and constancy for species recorded in 71 disturbed and/or early to mid-seral stands of the *Fraxinus pennsylvanica/Prunus virginiana* (green ash/choke cherry) habitat type

TABLE 7.	**% Can. Cov.**		
Species	**Avg.**	**Rng.**	**Con.**
Trees			
Acer negundo (Manitoba maple)	22	0-80	24
Fraxinus pennsylvanica (green ash)	46	10-80	100
Populus deltoides (plains cottonwood)	38	0-80	37
Populus tremuloides (aspen)	70	0-70	1
Ulmus americana (American elm)	32	0-60	24
Shrubs			
Amelanchier alnifolia (Saskatoon)	8	0-40	34
Artemisia cana (silver sagebrush)	6	0-30	15
Betula occidentalis (water birch)	3	0-3	1

TABLE 7.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Clematis spp. (clematis)	1	0-1	3
Clematis ligusticifolia (western clematis)	9	0-20	7
Cornus stolonifera (red-osier dogwood)	11	0-60	25
Crataegus douglasii (Douglas hawthorn)	1	0-1	3
Crataegus rotundifolia (round-leaved hawthorn)	2	0-3	3
Elaeagnus angustifolia (Russian olive)	8	0-20	6
Juniperus communis (ground juniper)	5	0-20	7
Juniperus scopulorum (Rocky Mountain juniper)	9	0-40	14
Parthenocissus inserta (large tooth Virginia creeper)	1	0-1	1
Parthenocissus quinquefolia (Virginia creeper)	1	0-1	1
Prunus americana (wild plum)	9	0-20	8
Prunus virginiana (choke cherry)	29	0-80	62
Rhus radicans (poison ivy)	13	0-60	17
Rhus trilobata (skunkbush)	8	0-20	11
Ribes americanum (wild black currant)	3	0-3	1
Ribes aureum (golden currant)	11	0-20	8
Ribes oxyacanthoides (northern gooseberry)	3	0-10	8
Ribes spp. (currant)	6	0-20	14
Rosa woodsii (common wild rose)	15	0-60	48
Rosa spp. (rose)	7	0-10	6
Rubus idaeus (wild red raspberry)	10	0-10	1
Salix amygdaloides (peach-leaved willow)	21	0-80	11
Salix bebbiana (beaked willow)	1	0-1	1
Salix exigua (sandbar willow)	35	0-98	13
Salix lutea (yellow willow)	5	0-20	10
Shepherdia argentea (thorny buffaloberry)	8	0-20	14
Symphoricarpos occidentalis (buckbrush)	24	0-80	73
Vitis riparia (riverbank grape)	12	0-20	3
Graminoids			
Agropyron pectiniforme (crested wheat grass)	20	0-20	1
Agropyron spp. (wheat grass)	2	0-3	3
Agropyron repens (quack grass)	23	0-80	14
Agropyron smithii (western wheat grass)	20	0-60	23
Agrostis spp. (Agrostis)	3	0-3	1
Agrostis stolonifera (redtop)	50	0-80	3
Agropyron trachycaulum (slender wheat grass)	18	0-40	10
Bouteloua gracilis (blue grama)	7	0-10	3
Bromus carinatus (keeled brome)	3	0-3	1
Bromus inermis (awnless brome)	34	0-98	38
Bromus japonicus (Japanese chess)	15	0-80	13
Bromus tectorum (downy chess)	13	0-40	7
Carex gravida (heavy sedge)	3	0-3	6
Carex hoodii (Hood's sedge)	1	0-1	1
Carex rostrata (beaked sedge)	3	0-3	1
Carex sprengelii (Sprengel's sedge)	30	0-80	20
Carex spp. (sedge)	1	0-1	1
Dactylis glomerata (orchard grass)	20	0-20	1
Elymus canadensis (Canada wild rye)	11	0-20	14
Elymus glaucus (smooth wild rye)	10	0-20	7
Elymus virginicus (Virginia wild rye)	20	0-60	18
Hordeum jubatum (foxtail barley)	7	0-20	10
Muhlenbergia asperifolia (scratch grass)	1	0-1	1
Muhlenbergia racemosa (marsh muhly)	3	0-3	1
Oryzopsis micrantha (little-seed rice grass)	14	0-40	13
Phalaris arundinacea (reed canary grass)	20	0-20	1
Phleum pratense (timothy)	10	0-10	1
Poa compressa (Canada bluegrass)	15	0-20	3
Poa palustris (fowl bluegrass)	9	0-20	6
Poa pratensis (Kentucky bluegrass)	45	0-80	51
Poa spp. (bluegrass)	11	0-20	4
Polypogon monspeliensis (rabbitfoot grass)	1	0-1	1
Scirpus pungens (three-square rush)	1	0-1	1
Spartina gracilis (alkali cord grass)	10	0-10	1
Stipa comata (needle-and-thread)	10	0-20	4
Stipa viridula (green needle grass)	1	0-3	11
Forbs			
Achillea millefolium (common yarrow)	1	0-3	13
Agastache foeniculum (giant hyssop)	1	0-1	1
Ambrosia psilostachya (perennial ragweed)	1	0-1	1
Ambrosia trifida (great ragweed)	3	0-3	1
Anemone cylindrica (long-fruited anemone)	1	0-1	1
Apocynum androsaemifolium (spreading dogbane)	12	0-20	3

TABLE 7.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Apocynum cannabinum (Indian hemp)	1	0-1	3
Aralia nudicaulis (wild sarsaparilla)	3	0-3	1
Arctium lappa (great burdock)	20	0-40	3
Arctium minus (common burdock)	17	0-40	6
Artemisia absinthium (absinthe wormwood)	5	0-10	3
Artemisia frigida (pasture sagewort)	1	0-3	4
Artemisia ludoviciana (prairie sagewort)	8	0-20	4
Asclepias speciosa (showy milkweed)	1	0-1	3
Asparagus officinalis (asparagus)	2	0-3	3
Aster ericoides (tufted white prairie aster)	2	0-3	4
Aster spp. (aster)	1	0-1	1
Chenopodium album (lamb's-quarters)	1	0-3	6
Cirsium arvense (Canada thistle)	12	0-60	18
Cirsium vulgare (bull thistle)	20	0-20	1
Collomia linearis (narrow-leaved collomia)	25	0-40	3
Convolvulus arvensis (field bindweed)	1	0-3	4
Convolvulus sepium (wild morning-glory)	1	0-1	1
Cynoglossum officinale (hound's-tongue)	20	0-40	3
Descurainia sophia (flixweed)	20	0-20	1
Disporum trachycarpum (fairybells)	10	0-10	1
Echinocystis lobata (wild cucumber)	1	0-1	1
Erysimum cheiranthoides (wormseed mustard)	3	0-3	1
Euphorbia esula (leafy spurge)	2	0-3	3
Galium aparine (cleavers)	12	0-20	13
Galium boreale (northern bedstraw)	12	0-40	17
Galium triflorum (sweet-scented bedstraw)	2	0-3	3
Geum aleppicum (yellow avens)	3	0-3	1
Glycyrrhiza lepidota (wild licorice)	16	0-98	18
Grindelia squarrosa (gumweed)	2	0-3	3
Hackelia americana (nodding stickseed)	10	0-20	3
Helenium autumnale (sneezeweed)	1	0-1	1
Helianthus couplandii (Coupland's annual sunflower)	1	0-1	1
Humulus lupulus (common hop)	1	0-1	1
Kochia scoparia (summer-cypress)	3	0-3	1
Lactuca pulchella (common blue lettuce)	2	0-3	3
Lactuca serriola (prickly lettuce)	3	0-3	1
Lappula squarrosa (bluebur)	10	0-10	1
Lysimachia ciliata (fringed loosestrife)	6	0-20	7
Medicago lupulina (black medick)	2	0-3	3
Medicago sativa (alfalfa)	1	0-1	1
Melilotus alba (white sweet-clover)	6	0-20	7
Melilotus officinalis (yellow sweet-clover)	17	0-60	15
Mentha arvensis (wild mint)	9	0-20	7
Monarda fistulosa (wild bergamot)	5	0-20	11
Nepeta cataria (catnip)	1	0-1	1
Opuntia polyacantha (prickly-pear)	2	0-3	3
Osmorhiza chilensis (blunt-fruited sweet cicely)	3	0-3	1
Osmorhiza longistylis (smooth sweet cicely)	3	0-3	1
Osmorhiza occidentalis (western sweet cicely)	20	0-20	1
Parietaria pensylvanica (American pellitory)	3	0-3	6
Plantago major (common plantain)	1	0-1	1
Polygonum ramosissimum (bushy knotweed)	3	0-3	1
Potentilla spp. (cinquefoil)	1	0-1	1
Pyrola asarifolia (common pink wintergreen)	1	0-1	1
Pyrola minor (lesser wintergreen)	3	0-3	1
Ranunculus abortivus (small-flowered buttercup)	1	0-1	1
Ranunculus cymbalaria (seaside buttercup)	1	0-1	1
Rumex crispus (curled dock)	3	0-3	3
Rumex triangulivalvis (narrow-leaved dock)	3	0-3	1
Sanicula marilandica (snakeroot)	8	0-20	7
Senecio indecorus (rayless ragwort)	10	0-10	1
Sisymbrium loeselii (tall hedge mustard)	3	0-3	1
Smilax herbacea (Carrionflower)	2	0-3	3
Smilacina racemosa (false Solomon's-seal)	20	0-20	1

TABLE 7.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Smilacina stellata (star-flowered Solomon's-seal)	11	0-60	18
Solidago canadensis (Canada goldenrod)	14	0-20	8
Solidago missouriensis (low goldenrod)	3	0-3	3
Solidago rigida (stiff goldenrod)	1	0-1	1
Sonchus asper (prickly annual sow-thistle)	1	0-1	1
Taraxacum laevigatum (red-seeded dandelion)	10	0-20	3
Taraxacum officinale (common dandelion)	13	0-60	15
Thalictrum dasycarpum (tall meadow rue)	6	0-20	14
Thalictrum venulosum (veiny meadow rue)	1	0-1	7
Thlaspi arvense (stinkweed)	3	0-3	1
Tragopogon dubius (common goat's-beard)	1	0-1	3
Trifolium spp. (clover)	1	0-1	1
Trifolium pratense (red clover)	20	0-20	1
Urtica dioica (common nettle)	5	0-10	3
Vicia americana (wild vetch)	3	0-3	1
Viola spp. (violet)	3	0-3	6
Viola canadensis (western Canada violet)	5	0-10	4
Viola nuttallii (yellow prairie violet)	1	0-1	1
Xanthium strumarium (cocklebur)	1	0-1	3
Ferns and Allies			
Equisetum arvense (common horsetail)	1	0-1	4

SOILS

Soils are typically Regosols or Chernozems. Textures range from clay loam to sandy loam. Water tables are generally near the soil surface in spring or after storm events but commonly fall below 1 m (39 in) during dry periods. Flooding is infrequent to this habitat type and duration is generally brief. However, *Fraxinus pennsylvanica* (green ash) is very tolerant of prolonged flooding and can withstand up to 8 weeks of total submersion and still survive.

ADJACENT COMMUNITIES

Adjacent drier sites are dominated by the *Artemisia cana/Agropyron smithii* (silver sagebrush/western wheat grass) habitat type or by a variety of upland species. Wetter sites may be dominated by *Typha latifolia* (common cattail), *Scirpus* species (bulrush), *Eleocharis* species (spike rush), or *Phragmites australis* (reed) habitat types.

MANAGEMENT INFORMATION

Livestock

Fraxinus pennsylvanica (green ash) is of low palatability to livestock but is often overbrowsed by livestock. If the long term management objective is the maintenance of the tree stand on the site, then managers need to key in on the seedling reproduction by *Fraxinus pennsylvanica* (green ash) or the stand will eventually be eliminated.

On relatively undisturbed sites, dense stands of the *Fraxinus pennsylvanica/Prunus virginiana* (green ash/choke cherry) habitat type limit access by livestock. As the stands open up, livestock use may go up proportionally. This habitat type is valuable to livestock managers because of the following benefits it provides: 1) thermal cover (shade), 2) water source, 3) palatable forage, 4) protection from seasonal storms, and 5) calving grounds. Because the *Fraxinus pennsylvanica/Prunus virginiana* (green ash/choke cherry) habitat type covers a small portion of the landscape and because of its high wildlife values (see the Wildlife section), these sites are becoming focal points for livestock and wildlife management conflicts in this region.

Livestock managers should reduce or eliminate hot season of use in this type. This can be accomplished by placing salt blocks on the uplands away from the woody draws, moving water sources out of the draws, and in some instances, by using cross fences (or drift fences) that are placed perpendicular to the linear stand at appropriate intervals. This method is most appropriate for those stands located in V-shaped draws or ravines. These short fences will discourage livestock from trailing down the centre of the stand. In disturbed sites, it may be necessary to fence out a portion of the stand for a period of five or more years in order to allow regeneration by the tree and shrub species. After the appropriate time frame, the fence could be moved to a different portion of the stand.

The use of these sites as winter feeding grounds can have a variety of results. In many instances, proper winter use will have minimal impacts on the stand. However, if livestock numbers are high, trampling and rubbing can have a detrimental impact on the woody species. If livestock use is high when the frost is going out of the ground, a great deal of soil churning and compaction can occur.

Over the years, there has been some debate whether *Prunus virginiana* (choke cherry) leaves are poisonous to livestock. The leaves and seeds do have sugars that contain cyanide. These cyanide sugars are not poisonous themselves, but when plant material is crushed, eaten or decomposed, enzymes cause hydrogen cyanide to be released (Ode Pers. Comm. 1987). In high concentrations, hydrogen cyanide is a metabolic poison to most animals, including humans. It has recently been shown that livestock can acquire the ability to detoxify hydrogen cyanide if they consume limited amounts of it over an extended period of time. Therefore, *Prunus virginiana* (choke cherry) will poison livestock only if it is consumed in large amounts without prior exposure.

The high values associated with the *Fraxinus pennsylvanica/Prunus virginiana* (green ash/choke cherry) habitat type should elicit special consideration by livestock operators.

Timber

In a study in eastern Montana, Hansen and Hoffman (1988) found basal areas range from 15.5 to 44.8 m^2/ha (67.5 to 195.2 square feet per acre). The average age of *Fraxinus pennsylvanica* (green ash) was 70 to 80 years old. Many stands have been cut for firewood. Due to the high value associated with this type, firewood cutting should be closely monitored.

Most of the important tree and shrub species in the *Fraxinus pennsylvanica/Prunus virginiana* (green ash/choke cherry) habitat type are capable of producing sprouts from the root crown when the main trunk in damaged. Some researchers have proposed cutting of the mature or decadent trees as a method of encouraging the production of new seedlings. Limited success has been shown by this approach. However, unless the management on the site is not changed, livestock and/or wildlife may browse all new sprouts with the result being the accelerated demise of the stand.

Wildlife

In the northern Great Plains, the *Fraxinus pennsylvanica/Prunus virginiana* (green ash/choke cherry) habitat type is very important to wildlife even though it represent a very small fraction of the total area (around 1-2 percent of the total landscape). Located in areas of greater than normal moisture, these stands are more productive than the surrounding upland vegetation (Thomas and others 1979). This habitat type attracts wildlife for thermal cover, nesting habitat, water source, late summer and winter forage, travel corridors, and hiding cover (Ames 1977, Hansen and others 1984, Hansen and Hoffman 1988, Severson and Boldt 1978). The *Fraxinus pennsylvanica/Prunus virginiana* (green ash/choke cherry) habitat type is an important year round habitat for mule deer, provides critical winter habitat for whitetail deer (Severson and Carter 1978, Swenson 1981), and is an important fawning area for both whitetail and mule deer. During fall and winter, this habitat type provides critical habitat for sharptailed grouse.

The *Fraxinus pennsylvanica/Prunus virginiana* (green ash/choke cherry) habitat type provides essential habitat for a large number of nongame species. Grosz and others (1981) found that this habitat type is the centre of activity for most species and is of critical importance to many species during the stressful winter months. They also found that these sites support a greater diversity and density of birds when compared to adjacent uplands. In northwestern North Dakota, Hopkins (1985) completed a census of species of birds nesting in this habitat type and found that although it had lower species diversity than cottonwood forests, the *Fraxinus pennsylvanica/Prunus virginiana* (green ash/choke cherry) habitat type supported a much higher density of breeding pairs. Finally, this habitat type provides important habitat for such nongame mammals as coyote, weasel, bobcat, and red fox (Swenson 1981, Sieg and others 1985).

If the long term management objective is the maintenance of the tree stand on the site, then managers need to key in on the seedling reproduction by *Fraxinus pennsylvanica* (green ash) or the stand will eventually be eliminated.

Fisheries

The woody species associated with the *Fraxinus pennsylvanica/Prunus virginiana* (green ash/choke cherry) habitat type provide valuable streambank stability and thermal cover.

Fire

Fraxinus pennsylvanica (green ash) has a good tolerance of fire when burned in the dormant state (Wasser 1982). Most of the important tree and shrub species in the *Fraxinus pennsylvanica/Prunus virginiana* (green ash/choke cherry) habitat type produce sprouts from the root crown when the main trunk is damaged. The ability of the woody species to sprout prolifically suggests that this habitat type is adapted to fire and perhaps to periodic stand regeneration by fire. However, the historic role of fire in this habitat type is not well known.

Soil Management and Rehabilitation Opportunities

Sites adjacent to streams are extremely vulnerable to streambank sloughing, particularly when soils are moist. Excessive livestock use will increase levels of soil compaction and decrease stability. Management should emphasize the importance of the understory shrub communities for streambank stabilization.

Where revegetation with woody species is desired, *Fraxinus pennsylvanica* (green ash), *Prunus virginiana* (choke cherry), *Amelanchier alnifolia* (Saskatoon), and *Ribes species* (currants and gooseberries) are well adapted to planting on disturbed sites. Rooted cuttings or nursery grown seedlings are easily established on moist, well-drained soils. Growth rates are moderate to rapid and the roots of established seedlings are effective stabilizers of alluvial soil deposits.

Recreational Uses and Considerations

Because of its proximity to streams, recreational developments and transportation corridors are common within this type. Recreational opportunities are excellent for fishing, big game, and waterfowl hunting, and observing a variety of bird species.

The fruit of *Prunus virginiana* (choke cherry) is highly regarded for making wine and tasty jelly, but one must harvest ahead of the birds (Johnson and Nichols 1982). Indians ate the fruit fresh or preserved it by drying. In addition, they combined it with venison and buffalo meat to make mincemeat. They also used the berries for medicinal purposes.

Care must be taken when locating structures within this type. Some campgrounds in Saskatchewan have been seriously damaged by floods or lost altogether.

OTHER STUDIES

The *Fraxinus pennsylvanica/Prunus virginiana* (green ash/choke cherry) habitat type was first described by Hansen and others (1984), and Hansen and Hoffman (1988) for the region. Girard (1985) described the same habitat type for southwestern North Dakota. Lawrence and Romo (1994) described an *Acer negundo* (Manitoba maple) community type on the Matador Research Station in southwestern Saskatchewan.

Populus balsamifera/Cornus stolonifera Community Type

(Balsam Poplar/Red-Osier Dogwood Community Type)

POPUBAL/CORNSTO
Number of Stands Sampled = 34
Number of Stands Sampled in Saskatchewan = 5

LOCATION AND ASSOCIATED LANDFORMS

The *Populus balsamifera/Cornus stolonifera* (balsam poplar/red-osier dogwood) community type is an incidental to minor type at low to mid elevations in south-central Saskatchewan. In the Prairie Ecozone, this type occurs on alluvial terraces of major streams and rivers, and around lakes and ponds. *Populus balsamifera* (balsam poplar) tends to occur at higher elevations and more northern latitude than *Populus deltoides* (plains cottonwood).

VEGETATION

This type is characterized by an overstory of cottonwoods over a potentially dense and diverse understory of shrubs and herbaceous plants. *Populus deltoides* (plains cottonwood) may be present but are subordinate to *Populus balsamifera* (balsam poplar).

Cornus stolonifera (red-osier dogwood) is the diagnostic shrub for this type. Other shrubs often present include *Rosa* species (rose), *Amelanchier alnifolia* (Saskatoon), *Rubus* (raspberry) species, and *Lonicera* (honeysuckle) species. A wide variety of herbaceous species is present including *Smilacina stellata* (star-flowered Solomon's-seal), and *Equisetum arvense* (common horsetail) (Table 8). Most sites of this type have been vegetatively altered to some degree by human usage, which causes a high constancy of such species as *Symphoricarpos occidentalis* (buckbrush), *Bromus inermis* (awnless brome), and *Poa pratensis* (Kentucky bluegrass).

Table 8. Average canopy cover, range of canopy cover, and constancy for species recorded in 18 stands of the *Populus balsamifera/Cornus stolonifera* (balsam poplar/red-osier dogwood) community type that are relatively undisturbed by livestock or wildlife

TABLE 8.	**% Can. Cov.**		
Species	**Avg.**	**Rng.**	**Con.**
Trees			
Betula papyrifera (white birch)	3	0-3	28
Picea glauca (white spruce)	1	0-1	6
Populus balsamifera (balsam poplar)	64	40-90	100
Populus tremuloides (aspen)	3	0-10	44
Shrubs			
Alnus tenuifolia (river alder)	7	0-10	22
Amelanchier alnifolia (Saskatoon)	7	0-30	61
Betula occidentalis (water birch)	2	0-3	11
Clematis ligusticifolia (western clematis)	1	0-1	6
Cornus canadensis (bunchberry)	1	0-1	11
Cornus stolonifera (red-osier dogwood)	30	3-70	100
Corylus cornuta (beaked hazelnut)	5	0-10	22
Linnaea borealis (twinflower)	1	0-1	11
Lonicera spp. (honeysuckle)	3	0-3	6

TABLE 8.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Lonicera dioica (twining honeysuckle)	5	0-10	17
Lonicera involucrata (bracted honeysuckle)	5	0-10	50
Prunus pensylvanica (pin cherry)	3	0-3	6
Prunus virginiana (choke cherry)	24	0-40	33
Rhus radicans (poison ivy)	3	0-3	6
Ribes americanum (wild black currant)	7	0-20	17
Ribes glandulosum (skunk currant)	3	0-3	6
Ribes lacustre (bristly black currant)	3	0-10	28
Ribes oxyacanthoides (northern gooseberry)	2	0-3	39
Ribes spp. (currant)	3	0-3	6
Ribes triste (wild red currant)	1	0-3	28
Rosa woodsii (common wild rose)	3	0-3	6
Rosa spp. (rose)	8	0-40	94
Rubus idaeus (wild red raspberry)	6	0-20	67
Rubus pubescens (dewberry)	3	0-10	61
Salix bebbiana (beaked willow)	7	0-30	39
Salix lutea (yellow willow)	3	0-3	11
Salix planifolia (flat-leaved willow)	1	0-1	6
Salix scouleriana (Scouler's willow)	5	0-10	33
Shepherdia canadensis (Canada buffaloberry)	1	0-1	6
Symphoricarpos albus (snowberry)	1	0-3	17
Symphoricarpos occidentalis (buckbrush)	6	0-40	50
Vaccinium caespitosum (dwarf bilberry)	1	0-1	6
Viburnum edule (low-bush cranberry)	7	0-10	44
Viburnum opulus (high-bush cranberry)	10	0-10	6
Graminoids			
Agropyron dasystachyum (northern wheat grass)	5	0-10	11
Agropyron trachycaulum (slender wheat grass)	1	0-1	11
Bromus anomalus (nodding brome)	1	0-1	6
Bromus inermis (awnless brome)	2	0-3	28
Calamagrostis canadensis (bluejoint)	7	0-30	72
Carex deflexa (bent sedge)	1	0-1	6
Carex praegracilis (graceful sedge)	1	0-1	6
Carex sprengelii (Sprengel's sedge)	3	0-3	6
Carex spp. (sedge)	1	0-1	11
Cinna latifolia (drooping wood-reed)	1	0-1	6
Elymus innovatus (hairy wild rye)	1	0-1	11
Phalaris arundinacea (reed canary grass)	10	0-10	6
Poa pratensis (Kentucky bluegrass)	2	0-3	11
Schizachne purpurascens (purple oat grass)	1	0-1	17
Stipa viridula (green needle grass)	20	0-20	6
Forbs			
Achillea millefolium (common yarrow)	3	0-3	6
Achillea sibirica (many-flowered yarrow)	1	0-1	6
Actaea rubra (red and white baneberry)	5	0-20	28
Anemone canadensis (Canada anemone)	3	0-3	6
Aralia nudicaulis (wild sarsaparilla)	16	0-80	61
Arctium lappa (great burdock)	1	0-1	6
Aster ciliolatus (Lindley's aster)	10	0-10	6
Aster conspicuus (showy aster)	4	0-10	39
Aster hesperius (western willow aster)	1	0-1	11
Aster modestus (large northern aster)	1	0-1	11
Athyrium filix-femina (lady fern)	1	0-1	6
Circaea alpina (small enchanter's nightshade)	10	0-10	6
Cirsium arvense (Canada thistle)	3	0-3	6
Cirsium drummondii (Drummond's thistle)	1	0-1	6
Disporum trachycarpum (fairybells)	1	0-1	11
Epilobium angustifolium (common fireweed)	3	0-20	44
Fragaria virginiana (wild strawberry)	1	0-3	39
Galeopsis tetrahit (hemp-nettle)	2	0-3	11
Galium boreale (northern bedstraw)	3	0-10	44
Galium trifidum (small bedstraw)	1	0-1	6
Galium triflorum (sweet-scented bedstraw)	4	0-20	39
Geranium richardsonii (wild white geranium)	2	0-3	11
Geum aleppicum (yellow avens)	1	0-1	6
Gymnocarpium dryopteris (oak fern)	1	0-1	6
Heracleum lanatum (cow parsnip)	1	0-3	28

TABLE 8.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Lathyrus ochroleucus (cream-colored vetchling)	3	0-10	33
Lysimachia ciliata (fringed loosestrife)	1	0-1	6
Maianthemum canadense (wild lily-of-the-valley)	1	0-1	17
Mertensia paniculata (tall lungwort)	5	0-20	44
Mitella nuda (bishop's-cap)	2	0-3	22
Moehringia lateriflora (blunt-leaved sandwort)	1	0-1	17
Petasites palmatus (palmate-leaved coltsfoot)	1	0-3	44
Pyrola asarifolia (common pink wintergreen)	1	0-1	11
Ranunculus spp. (ranunculus)	3	0-3	6
Sanicula marilandica (snakeroot)	10	0-10	6
Scutellaria galericulata (marsh skullcap)	2	0-3	11
Smilacina stellata (star-flowered Solomon's-seal)	2	0-3	44
Smilacina trifolia (three-leaved Solomon's-seal)	1	0-1	6
Solidago canadensis (Canada goldenrod)	2	0-3	28
Solidago spp. (goldenrod)	1	0-1	6
Solidago gigantea (late goldenrod)	1	0-1	6
Sonchus arvensis (perennial sow-thistle)	3	0-3	6
Stachys palustris (marsh hedge-nettle)	3	0-3	17
Stellaria longifolia (long-leaved chickweed)	3	0-3	6
Taraxacum officinale (common dandelion)	1	0-1	22
Thalictrum spp. (meadow rue)	3	0-3	6
Thalictrum venulosum (veiny meadow rue)	4	0-10	28
Thermopsis rhombifolia (golden bean)	10	0-10	6
Trientalis borealis (northern starflower)	1	0-1	6
Urtica dioica (common nettle)	1	0-1	22
Vicia americana (wild vetch)	1	0-3	33
Viola canadensis (western Canada violet)	5	0-10	17
Viola renifolia (kidney-leaved violet)	1	0-1	6
Ferns and Allies			
Equisetum arvense (common horsetail)	4	0-10	67

SUCCESSIONAL INFORMATION

The *Populus balsamifera/Cornus stolonifera* (balsam poplar/red-osier dogwood) community type represents a mid-seral stage of primary succession.

Primary Successional Stages

Cottonwoods are a pioneering species that for establishment require moist, barren, newly deposited alluvium that is exposed to full sunlight. In general, these sites represent point bars, side bars, mid channel bars, delta bars, and islands along major streams. Since cottonwoods are a pioneering species, and do not regenerate in their own shade, they are considered a seral species and do not represent the climax vegetation or potential for the site. Many stands may appear to have some limited regeneration, especially in open areas. However, it is important to understand that these young plants represent root sprouts (asexual reproduction), not establishment by seeds (sexual reproduction). These sprouts may prolong the life of the stand, but will not perpetuate it. If the site is left undisturbed, in time the cottonwoods will be replaced by a later successional stage.

Erosion and deposition along a river help maintain plant community diversity on its floodplain. Distribution of the various plant communities depends on the river dynamics. Channel migration rate determines the proportion of floodplain communities in early seral, mid seral, late seral, or climax (PNC) successional stage. If the migration rate is high, few stands progress to late successional stage. Near the outer edges of the floodplain, effect of the river is reduced, allowing more late stages to develop. Lateral movement of the river initiates a dynamic series of vegetation events. The stream erodes its banks on outside curves, typically covered with riparian vegetation in later successional stages. The stream then deposits fresh alluvium on point bars along inside curves. Each new alluvial deposit adds to or forms a distinct band or terrace supporting a vegetation community of a different age. The bands generally are progressively older as one moves away from the channel and onto higher terraces. Parts of the floodplain may remain undisturbed long enough for their elevation to increase enough with respect to the channel that they are rarely, if ever, flooded. These are considered old, mature alluvial terraces, and they may continue development toward climax (PNC) without the modifying influences of floods (Hansen 1989).

Early Seral Stage—The *Populus balsamifera*/Recent Alluvial Bar (balsam poplar/Recent Alluvial Bar) community type is the earliest seral stage of this type.

Mid-Seral Stage—If disturbance (human-caused or natural) does not eliminate the stand, the *Populus balsamifera*/Recent Alluvial Bar (balsam poplar/Recent Alluvial Bar) community type will progress to the relatively undisturbed mid-seral stage, *Populus balsamifera/Cornus stolonifera* (balsam poplar/red-osier dogwood) community type. Normally, the understory under a pole to mature *Populus balsamifera* (balsam poplar) stand is dominated by young plants of other tree species climax to the site, such as *Picea glauca* (white spruce) or *Populus tremuloides* (aspen). If no climax tree species are present, the stand may progress to a tall shrub type dominated by *Salix bebbiana* (beaked willow). As the *Populus balsamifera* (balsam poplar) overstory matures, becomes open, and finally, decadent, these species are ready to replace them.

Late Seral to Climax (PNC) Stage—As the cottonwood stand dies, primary succession toward a climax community progresses unless flooding deposits new sediment suitable for cottonwood seedlings. In the absence of such deposition at an opportune time, succession continues from the *Populus balsamifera/Cornus stolonifera* (balsam poplar/red-osier dogwood) community type to a habitat type dominated by one of such species as *Picea glauca* (white spruce), *Populus tremuloides* (aspen), or *Salix bebbiana* (beaked willow).

Secondary Successional Stages

The presence or absence of a particular understory community may aid in determining degree of disturbance (present and historical) on a site. On relatively undisturbed sites, the *Populus balsamifera* (balsam poplar) understory will contain a diverse, dense shrub layer dominated by *Cornus stolonifera* (red-osier dogwood), *Amelanchier alnifolia* (Saskatoon), *Prunus virginiana* (choke cherry), various *Salix* species (willows), and *Ribes* species (currants and gooseberries).

With moderate grazing or browsing, *Symphoricarpos occidentalis* (buckbrush) and *Rosa* species (rose) will increase with a corresponding decrease in abundance and canopy cover of *Cornus stolonifera* (red-osier dogwood), *Amelanchier alnifolia* (Saskatoon), *Prunus virginiana* (choke cherry), and species of *Ribes*. (currants and gooseberries). If grazing or browsing pressures continue, the more desirable shrubs will be eliminated, leaving *Symphoricarpos occidentalis* (buckbrush) and *Rosa* species (rose) to form a nearly impenetrable understory. This is the *Populus balsamifera/Symphoricarpos occidentalis* (balsam poplar/buckbrush) community type stage of disturbance-caused secondary succession. If the disturbance is severe enough, ***ALL*** shrubs can be eliminated, and the understory converted to herbaceous, dominated by species such as *Poa pratensis* (Kentucky bluegrass), *Phleum pratensis* (timothy), *Bromus inermis* (awnless brome), and a variety of "weedy" forbs. This extremely disturbed stage is the *Populus balsamifera*/Herbaceous (balsam poplar/Herbaceous) community type.

During the process of converting from a naturally diverse, dense shrub understory to a disturbed herbaceous understory, the stand will open underneath, causing it to become drier. Finally the stand becomes decadent with widely spaced, dying cottonwoods. The site can become open and dry enough to change the potential to an upland type, as indicated by the presence of upland species. Such conversion may be slow due to persistence of some of the sod forming grasses. Remnant riparian shrubs and graminoids, if present will help indicate potential undergrowth composition.

Once the stand has converted from a shrub-dominated understory to one dominated by introduced herbaceous species, the potential for returning the site to its former state (shrub dominated) is very difficult. It may be possible, but will require a drastic change in management and may be very costly. Therefore, if a manager wants to maintain the shrub-dominated understory, the most cost effective way is to change the management ***BEFORE*** the site is too degraded.

SOILS

Soils are typically Regosols with up to 1 m (39 in) of mineral soil overlying river gravel and/or cobbles. Brunisols and Chernozems can also be found on older sites of relatively longer stability where time has allowed more development to occur. Soil texture varies from loam to coarse sand. Water tables usually drop below 1 m (39 in) of the soil surface in summer, but soils can remain moist due to capillary action. Redox concentrations (mottles) are common in these soils as evidence of a fluctuating water table. Soils are generally well drained with low available water. Coarse textured soils, moderate stream gradients, and high coarse fragment contents throughout the soil profile provide an environment of rapidly moving, highly aerated groundwater. This type of substrate is common to many floodplain communities.

ADJACENT COMMUNITIES

Adjacent wetter communities are often the *Salix exigua* (sandbar willow) community type or the *Typha latifolia* (common cattail) and *Eleocharis* (spike rush) dominated habitat types. The *Populus balsamifera*/Herbaceous (balsam poplar/Herbaceous) community type or the *Populus balsamifera/Symphoricarpos occidentalis* (balsam poplar/buckbrush) community type may be adjacent on disturbed sites, or by a variety of upland species on drier sites.

MANAGEMENT INFORMATION

Livestock

Forage production ranges from low to moderate due to the dense nature of the stands of the *Populus balsamifera/Cornus stolonifera* (balsam poplar/red-osier dogwood) community type. Stands in good to excellent health (condition) often support dense thickets of shrubs, limiting the available forage. *Cornus stolonifera* (red-osier dogwood) is an "ice cream" plant to livestock and wildlife. Its abundance is a direct indication of past and current use levels. In some sites livestock browsing of *Cornus stolonifera* (red-osier dogwood) may be quite high.

Sites are often subjected to heavy grazing pressure because of their gentle topography and ease of access. With moderate to heavy prolonged grazing pressure, palatable shrubs will be eliminated leaving mostly *Symphoricarpos occidentalis* (buckbrush) and *Rosa* species (rose) as the dominant understory. At this stage, the stand has been converted to the *Populus balsamifera/Symphoricarpos occidentalis* (balsam poplar/buckbrush) disturbance-caused community type. If continued disturbance is severe, these shrubs also will be eliminated, and the stand converted to the *Populus balsamifera*/Herbaceous (balsam poplar/Herbaceous) disturbance-caused community type (see the discussion under the Seral Stages section).

Timber

The timber productivity of all cottonwood types is moderate to high due to favourable moisture conditions. Complete stand removal will likely result in a shrub-dominated community with extremely limited, if any, cottonwood regeneration. The occasional sprouts from stumps are unlikely to reach maturity.

Wildlife

The *Populus balsamifera/Cornus stolonifera* (balsam poplar/red-osier dogwood) community type provides valuable cover, shade, and food for a variety of species. Big game use may be high, depending upon the time of year. The spreading crown of *Populus balsamifera* (balsam poplar) provides sites for huge platform-like stick nests of bald eagles and ospreys (Arno and Hammerly 1984) and for great blue herons (Parker 1980). Canada geese occasionally use the nests previously built by bald eagles and osprey. A variety of birds and mammals, such as woodpeckers, great horned owls, wood ducks, and raccoons, nest in trunk cavities. *Populus balsamifera* (balsam poplar) and *Cornus stolonifera* (red-osier dogwood) are often eaten by moose (Costain 1989) and used by beaver for food and building materials (Allen 1983). Understory species provide food and cover for waterfowl, small birds, and mammals (Dittberner and Olson 1983).

Fisheries

Due to the streamside location of the *Populus balsamifera/Cornus stolonifera* (balsam poplar/red-osier dogwood) community type, it provides thermal cover, debris, and streambank stability. Its importance cannot be emphasized enough (see discussion in the Soil Management and Rehabilitation Opportunities section). *Cornus stolonifera* (red-osier dogwood) and associated shrub species are excellent in controlling erosion along streams. This is particularly important on the higher gradient streams where scouring by seasonal flooding may occur.

Fire

The *Populus balsamifera/Cornus stolonifera* (balsam poplar/red-osier dogwood) community type is susceptible to fire during the late summer and fall. *Populus balsamifera* (balsam poplar) and shrubs associated with this type are adapted to light, and under some conditions, to fires of moderate intensity. Many of these species can produce new sprouts after a burn. The ability of cottonwoods to produce new sprouts following fire seems to be dependent upon three criteria:

1) The particular species of cottonwood. In general, Populus balsamifera (balsam poplar) has a greater sprouting capability than Populus deltoides (plains cottonwood).
2) The age of the trees. As cottonwoods mature, the sprouting potential decreases. As the trees reach late maturity, sprouting potential is very limited.
3) The location of the water table. In general, the higher the water table is during the growing season, the greater the survivability of resprouts.

Therefore, if a manager wants to extend the life of a cottonwood stand, fire ***MAY BE*** used as a tool in the pole to early mature stage of development. If fire is used to rehabilitate a stand, it is imperative that the stand is excluded from all livestock grazing for at least five years and that wildlife browsing be closely monitored.

Cornus stolonifera (red-osier dogwood) and the associated shrub species can survive all but the most severe fires that remove duff and cause extended heating of the upper layer of soil. After a fire, these shrubs sprout from the surviving rhizomes or stolons (runners) (Fischer and Bradley 1987).

Soil Management and Rehabilitation Opportunities

Coarse textured soils are not as susceptible to compaction. This community type is subject to recurring scouring by floods and alluvium deposition. However, stands are relatively stable because of the strong root systems of the associated species. Management should emphasize the importance of the understory shrub layer in streambank stabilization. This is very important on higher gradient streams.

Managers should maintain a buffer of *Populus balsamifera* (balsam poplar) community types adjacent to rivers and streams. These buffers provide wildlife habitat, reduce sediment loading in the stream, stabilize streambanks, and dissipate flood energy. If the site still has a fairly high water table, a dramatic change in management (i.e. elimination of livestock grazing and close monitoring of wildlife impacts) ***MAY*** allow remnant shrubs to sprout and repopulate the stand. However, if the water table has dropped much, or if the shrubs are completely gone, the opportunity to re-establish an understory of desirable shrubs may have been lost.

Where revegetation with shrubs is the goal, some desirable species such as *Cornus stolonifera* (red-osier dogwood), *Amelanchier alnifolia* (Saskatoon), *Prunus virginiana* (choke cherry), and various species of *Salix* (willows) and *Ribes* (currants and gooseberries) may be well adapted to planting on disturbed sites. Rooted cuttings or nursery grown seedlings are easily established on moist, well-drained soils. Growth rates are rapid and the roots of established seedlings effectively stabilize recently bare soil. Remember: If the canopy cover of trees in the stand has opened up too much and/or the water table has been severely lowered, revegetation success with desirable woody species will be low.

When considering rehabilitation of stands with fire, see the discussion above in the Fire Management section about the inherent problems of fire as a tool for rehabilitation. If fire is to be used to rehabilitate a stand, it is imperative that the stand is excluded from all livestock grazing for at least five years and that browsing by wildlife be closely monitored.

The following guidelines should be followed when attempting to revegetate sites with cuttings from cottonwoods (Swenson 1988):

1) Do not plant cottonwoods on saline or alkaline sites.
2) Select sites with substrates of sand, gravel, or small cobbles. Avoid sites that are classified as clays or have a thick clay layer.
3) Make cuttings from open stands of young, rapidly growing trees. Use only cuttings that are four years old or less. Make cuttings long enough to provide 1 to 2 m (3 to 6 ft) of top length left above the soil surface (see #6 and #7 below). Remove lower branches, leaving only the tip and top two side branches.
4) Make cuttings when the plants are completely dormant.
5) Soak the cuttings in water for 10 to 14 days.
6) Auger holes to the depth of the lowest anticipated growing season water table level.
7) Place cuttings in the augered holes on the same day they are removed from the soak. Set the butt to the lowest level anticipated that the growing season groundwater would drop.
8) Back fill the holes carefully to avoid leaving air pockets.
9) Place tree guards around the cuttings if rodent or rabbit damage is likely.
10) As buds begin to swell along the cuttings, remove them from the lower two-thirds of the cutting.
11) Plantings must be protected from livestock grazing and big game browsing for two or three growing seasons. Beaver control may also be needed.

Recreational Uses and Considerations

Because of proximity to streams and flat topography, recreational developments and transportation corridors are common in this type. Opportunities are excellent in this type for fishing, big game, and waterfowl hunting, and observing a variety of bird species.

Care must be taken when locating structures in this type. Some campgrounds have been seriously damaged by floods or lost altogether.

OTHER STUDIES

The *Populus balsamifera/Cornus stolonifera* (balsam poplar/red-osier dogwood) community type is described for the mountains, foothills, and intermountain valleys of Montana by Hansen and others (1995). Similar communities have been reported for western Montana (Foote 1965), central Oregon (Kovalchik 1987), and central Idaho (Tuhy and Jensen 1982). Moss (1932) found *Cornus stolonifera* (red-osier dogwood) to be the leading "characteristic" shrub species of the *Populus balsamifera* (balsam poplar) "consociation" in central Alberta.

Populus balsamifera/Herbaceous Community Type
(Balsam Poplar/Herbaceous Community Type)

POPUBAL
Number of Stands Sampled = 14
Number of Stands Sampled in Saskatchewan = 2

LOCATION AND ASSOCIATED LANDFORMS

The *Populus balsamifera*/Herbaceous (balsam poplar/Herbaceous) community type is an incidental to minor type at low to mid elevations in south-central Saskatchewan. In the Prairie Ecozone, this type occurs on alluvial terraces of major streams and rivers, and around lakes and ponds. *Populus balsamifera* (balsam poplar) tends to occur at higher elevations and more northern latitude than *Populus deltoides* (plains cottonwood).

VEGETATION

The *Populus balsamifera*/Herbaceous (balsam poplar/herbaceous) community type is a grazing or browsing disclimax community type characterized by a two layer structure of mature, widely spaced *Populus balsamifera* (balsam poplar) over an understory of grasses dominated by *Bromus inermis* (awnless brome), *Poa pratensis* (Kentucky bluegrass), or *Phleum pratense* (timothy). Some shrub species may be present as remnant, scattered individuals (Table 9).

Table 9. Average canopy cover, range of canopy cover, and constancy for those species recorded in 12 sampled stands of the grazing or browsing disclimax *Populus balsamifera*/Herbaceous (balsam poplar/Herbaceous) community type.

TABLE 9.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Trees			
Fraxinus pennsylvanica (green ash)	3	0-3	7
Picea glauca (white spruce)	1	0-1	7
Populus balsamifera (balsam poplar)	58	30-98	100
Populus tremuloides (aspen)	2	0-3	43
Shrubs			
Alnus tenuifolia (river alder)	1	0-1	7
Amelanchier alnifolia (Saskatoon)	1	0-3	29
Berberis repens (creeping mahonia)	1	0-1	7
Betula occidentalis (water birch)	1	0-1	7
Clematis spp. (clematis)	3	0-3	7
Clematis occidentalis (purple clematis)	1	0-1	7
Cornus stolonifera (red-osier dogwood)	2	0-3	21
Corylus cornuta (beaked hazelnut)	10	0-10	7
Elaeagnus commutata (silverberry)	5	0-10	14
Prunus virginiana (choke cherry)	2	0-3	21
Ribes aureum (golden currant)	3	0-3	14

TABLE 9.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Ribes inerme (mountain gooseberry)	1	0-1	7
Ribes oxyacanthoides (northern gooseberry)	1	0-1	7
Rosa woodsii (common wild rose)	2	0-3	14
Rosa spp. (rose)	1	0-3	36
Rubus idaeus (wild red raspberry)	10	0-10	7
Salix bebbiana (beaked willow)	1	0-3	21
Salix lutea (yellow willow)	1	0-1	7
Salix myrtillifolia (myrtle-leaved willow)	3	0-3	7
Salix pseudomonticola (false mountain willow)	1	0-1	7
Salix spp. (willow)	20	0-20	7
Shepherdia canadensis (Canada buffaloberry)	2	0-3	21
Symphoricarpos occidentalis (buckbrush)	3	0-10	64
Graminoids			
Agropyron pectiniforme (crested wheat grass)	3	0-3	7
Agropyron repens (quack grass)	10	0-10	7
Agrostis scabra (rough hair grass)	20	0-20	7
Agropyron smithii (western wheat grass)	10	0-10	7
Agrostis stolonifera (redtop)	1	0-1	21
Agropyron trachycaulum (slender wheat grass)	1	0-1	7
Alopecurus occidentalis (alpine foxtail)	3	0-3	7
Bromus inermis (awnless brome)	41	0-90	64
Calamagrostis canadensis (bluejoint)	10	0-10	7
Calamagrostis stricta (narrow reed grass)	1	0-1	7
Carex atherodes (awned sedge)	3	0-3	7
Carex lanuginosa (woolly sedge)	1	0-1	7
Carex sprengelii (Sprengel's sedge)	2	0-3	14
Carex spp. (sedge)	3	0-3	7
Dactylis glomerata (orchard grass)	1	0-1	7
Elymus virginicus (Virginia wild rye)	1	0-1	14
Hordeum jubatum (foxtail barley)	10	0-10	7
Melica subulata (Alaska onion grass)	3	0-3	7
Phalaris arundinacea (reed canary grass)	10	0-10	7
Phleum pratense (timothy)	15	0-60	50
Poa interior (inland bluegrass)	1	0-1	7
Poa nervosa (Wheeler's bluegrass)	3	0-3	7
Poa palustris (fowl bluegrass)	5	0-10	14
Poa pratensis (Kentucky bluegrass)	15	0-50	71
Stipa comata (needle-and-thread)	1	0-1	7
Forbs			
Achillea millefolium (common yarrow)	1	0-3	21
Achillea sibirica (many-flowered yarrow)	1	0-1	7
Actaea rubra (red and white baneberry)	1	0-1	7
Allium cernuum (nodding onion)	1	0-1	7
Anemone cylindrica (long-fruited anemone)	3	0-3	7
Angelica arguta (white angelica)	2	0-3	14
Aralia nudicaulis (wild sarsaparilla)	30	0-30	7
Artemisia ludoviciana (prairie sagewort)	1	0-1	7
Aster ascendens (western aster)	1	0-1	7
Aster conspicuus (showy aster)	3	0-3	7
Aster hesperius (western willow aster)	3	0-3	7
Aster laevis (smooth aster)	2	0-3	21
Aster modestus (large northern aster)	1	0-1	7
Chrysanthemum leucanthemum (ox-eye daisy)	1	0-1	7
Cirsium arvense (Canada thistle)	5	0-10	14
Cirsium undulatum (wavy-leaved thistle)	20	0-20	7
Cynoglossum officinale (hound's-tongue)	2	0-3	14
Descurainia sophia (flixweed)	1	0-1	7
Disporum trachycarpum (fairybells)	1	0-1	7
Unknown Forb	2	0-3	14
Fragaria virginiana (wild strawberry)	2	0-3	21
Galium boreale (northern bedstraw)	2	0-3	14
Galium triflorum (sweet-scented bedstraw)	10	0-10	7
Geranium richardsonii (wild white geranium)	6	0-10	29
Geum aleppicum (yellow avens)	1	0-1	7
Glycyrrhiza lepidota (wild licorice)	2	0-3	36
Hackelia floribunda (large-flowered stickseed)	1	0-1	7
Heracleum lanatum (cow parsnip)	5	0-10	21
Hieracium umbellatum (narrow-leaved hawkweed)	1	0-1	7
Lathyrus ochroleucus (cream-colored vetchling)	1	0-1	14

TABLE 9.	% Can. Cov.		
Species	Avg.	Rng.	Con.
Lathyrus venosus (purple peavine)	1	0-1	7
Lathyrus spp. (vetchling)	1	0-1	7
Linaria dalmatica (broad-leaved toad-flax)	1	0-1	7
Linaria vulgaris (butter-and-eggs)	10	0-10	7
Lomatium dissectum (mountain wild parsnip)	1	0-1	7
Lysimachia ciliata (fringed loosestrife)	3	0-3	7
Medicago lupulina (black medick)	1	0-1	7
Melilotus alba (white sweet-clover)	1	0-1	14
Melilotus officinalis (yellow sweet-clover)	1	0-1	7
Monarda fistulosa (wild bergamot)	1	0-1	14
Osmorhiza chilensis (blunt-fruited sweet cicely)	5	0-10	14
Osmorhiza depauperata (spreading sweet cicely)	3	0-3	7
Osmorhiza occidentalis (western sweet cicely)	1	0-1	7
Pedicularis bracteosa (western lousewort)	1	0-1	14
Petasites sagittatus (arrow-leaved coltsfoot)	1	0-1	7
Potentilla pensylvanica (prairie cinquefoil)	1	0-1	7
Prunella vulgaris (heal-all)	1	0-1	7
Pyrola asarifolia (common pink wintergreen)	1	0-1	7
Pyrola spp. (wintergreen)	3	0-3	7
Rudbeckia laciniata (tall coneflower)	10	0-10	7
Sanicula marilandica (snakeroot)	3	0-3	7
Senecio foetidus (marsh butterweed)	1	0-1	7
Senecio pauperculus (balsam groundsel)	3	0-3	7
Senecio pseudaureus (thin-leaved ragwort)	1	0-1	7
Smilacina stellata (star-flowered Solomon's-seal)	3	0-10	43
Solidago canadensis (Canada goldenrod)	4	0-10	29
Solidago gigantea (late goldenrod)	10	0-10	7
Solidago missouriensis (low goldenrod)	1	0-1	7
Sonchus arvensis (perennial sow-thistle)	1	0-1	7
Spiranthes romanzoffiana (hooded ladies'-tresses)	1	0-1	14
Stachys palustris (marsh hedge-nettle)	3	0-3	7
Streptopus amplexifolius (clasping-leaved twisted-stalk)	1	0-1	7
Tanacetum vulgare (common tansy)	1	0-1	7
Taraxacum laevigatum (red-seeded dandelion)	1	0-1	7
Taraxacum officinale (common dandelion)	3	0-10	43
Thalictrum dasycarpum (tall meadow rue)	2	0-3	14
Thalictrum spp. (meadow rue)	10	0-10	7
Thalictrum occidentale (western meadow rue)	1	0-1	7
Thalictrum venulosum (veiny meadow rue)	1	0-1	14
Thermopsis rhombifolia (golden bean)	3	0-3	7
Trifolium repens (white clover)	1	0-1	14
Urtica dioica (common nettle)	10	0-20	14
Vicia americana (wild vetch)	1	0-1	36
Viola spp. (violet)	1	0-1	7
Viola canadensis (western Canada violet)	3	0-3	21
Ferns and Allies			
Equisetum arvense (common horsetail)	3	0-10	43
Equisetum hyemale (common scouring-rush)	1	0-1	14

SUCCESSIONAL INFORMATION

The *Populus balsamifera*/Herbaceous (balsam poplar/herbaceous) community type represents a severely disturbed secondary successional stage of the mid-seral *Populus balsamifera/Cornus stolonifera* (balsam poplar/red-osier dogwood) community type.

Primary Successional Stages

Cottonwoods are a pioneering species that for establishment require moist, barren, newly deposited alluvium that is exposed to full sunlight. In general, these sites represent point bars, side bars, mid channel bars, delta bars, and islands along major streams. Since cottonwoods are a pioneering species, and do not regenerate in their own shade, they are considered a seral species and do not represent the climax vegetation or potential for the site. Many stands may appear to have some limited regeneration, especially in open areas. However, it is important to understand that these young plants represent root sprouts (asexual reproduction), not establishment by seeds (sexual reproduction). These sprouts may prolong the life of the stand, but will not perpetuate it. If the site is left undisturbed, in time the cottonwoods will be replaced by a later successional stage.

Erosion and deposition along a river help maintain plant community diversity on its floodplain. Distribution of the various plant communities depends on the river dynamics. Channel migration rate determines the proportion of floodplain communities in early seral, mid seral, late seral, or climax (PNC) successional stage. If the migration rate is high, few stands progress to late successional stage. Near the outer edges of the floodplain, effect of the river is reduced, allowing more late stages to develop. Lateral movement of the river initiates a dynamic series of vegetation events. The stream erodes its banks on outside curves, typically covered with riparian vegetation in later successional stages. The stream then deposits fresh alluvium on point bars along inside curves. Each new alluvial deposit adds to or forms a distinct band or terrace supporting a vegetation community of a different age. The bands generally are progressively older as one moves away from the channel and onto higher terraces. Parts of the floodplain may remain undisturbed long enough for their elevation to increase enough with respect to the channel that they are rarely, if ever, flooded. These are considered old, mature alluvial terraces, and they may continue development toward climax (PNC) without the modifying influences of floods (Hansen 1989).

Early Seral Stage—The *Populus balsamifera*/Recent Alluvial Bar (balsam poplar/Recent Alluvial Bar) community type is the earliest seral stage of this type.

Mid-Seral Stage—If disturbance (human-caused or natural) does not eliminate the stand, the *Populus balsamifera*/Recent Alluvial Bar (balsam poplar/Recent Alluvial Bar) community type will progress to the relatively undisturbed mid-seral stage, *Populus balsamifera/Cornus stolonifera* (balsam poplar/red-osier dogwood) community type. Normally, the understory under a pole to mature *Populus balsamifera* (balsam poplar) stand is dominated by young plants of other tree species climax to the site, such as *Picea glauca* (white spruce) or *Populus tremuloides* (aspen). If no climax tree species are present, the stand may progress to a tall shrub type dominated by *Salix bebbiana* (beaked willow). As the *Populus balsamifera* (balsam poplar) overstory matures, becomes open, and finally, decadent, these species are ready to replace them.

Late Seral to Climax (PNC) Stage—As the cottonwood stand dies, primary succession toward a climax community progresses unless flooding deposits new sediment suitable for cottonwood seedlings. In the absence of such deposition at an opportune time, succession continues from the *Populus balsamifera/Cornus stolonifera* (balsam poplar/red-osier dogwood) community type to a habitat type dominated by such species as *Picea glauca* (white spruce), *Populus tremuloides* (aspen), or *Salix bebbiana* (beaked willow).

Secondary Successional Stages

The presence or absence of a particular understory community may aid in determining degree of disturbance (present and historical) on a site. On relatively undisturbed sites, the *Populus balsamifera* (balsam poplar) understory will contain a diverse, dense shrub layer dominated by *Cornus stolonifera* (red-osier dogwood), *Amelanchier alnifolia* (Saskatoon), *Prunus virginiana* (choke cherry), various *Salix* species (willows), and *Ribes* (currants and gooseberries).

With moderate grazing or browsing, *Symphoricarpos occidentalis* (buckbrush) and *Rosa* species (rose) will increase with a corresponding decrease in abundance and canopy cover of *Cornus stolonifera* (red-osier dogwood), *Amelanchier alnifolia* (Saskatoon), *Prunus virginiana* (choke cherry), and *Ribes* (currants and gooseberries). If grazing or browsing pressures continue, the more desirable shrubs will be eliminated, leaving *Symphoricarpos occidentalis* (buckbrush) and *Rosa* species (rose) to form a nearly impenetrable understory. This is the *Populus balsamifera/Symphoricarpos occidentalis* (balsam poplar/buckbrush) community type stage of disturbance-caused secondary succession. If the disturbance is severe enough, ***ALL*** shrubs can be eliminated and the understory converted to herbaceous, dominated by species such as *Poa pratensis* (Kentucky bluegrass), *Phleum pratense* (timothy), *Bromus inermis* (awnless brome), and a variety of "weedy" forbs. This extremely disturbed stage is the *Populus balsamifera*/Herbaceous (balsam poplar/Herbaceous) community type.

During the process of converting from a naturally diverse, dense shrub understory to a disturbed herbaceous understory, the stand will open underneath, causing it to become drier. Finally the stand becomes decadent with widely spaced, dying cottonwoods. The site can become open and dry enough to change the potential to an upland type, as indicated by the presence of upland species. Such conversion may be slow due to persistence of some of the sod forming grasses. Remnant riparian shrubs and graminoids, if present will help indicate potential undergrowth composition.

Once the stand has converted from a shrub-dominated understory to one dominated by introduced herbaceous species, the potential for returning the site to its former state (shrub dominated) is very difficult. It may be possible, but will require a drastic change in management and may be very costly. Therefore, if a manager wants to maintain the shrub-dominated understory, the most cost effective way is to change the management ***BEFORE*** the site is too degraded.

SOILS

Soils are typically Regosols with up to 1 m (39 in) of mineral soil overlying river gravel and/or cobbles. Brunisols and Chernozems can also be found on older sites of relatively longer stability where time has allowed more development to occur. Soil texture varies from loam to coarse sand. Water tables usually drop below 1 m (39 in) of the soil surface in summer, but soils can remain moist due to capillary action. Redox concentrations (mottles) are common in these soils as evidence of a fluctuating water table. Soils are generally well drained with low available water. Coarse textured soils, moderate stream gradients, and high coarse fragment contents throughout the soil profile provide an environment of rapidly moving, highly aerated groundwater. This type of substrate is common to many floodplain communities.

ADJACENT COMMUNITIES

Adjacent wetter communities are often the *Salix exigua* (sandbar willow) community type or the *Typha latifolia* (common cattail) and *Eleocharis* (spike rush) dominated habitat types. The *Populus balsamifera/Cornus stolonifera* (balsam poplar/red-osier dogwood) community type or the *Populus balsamifera/Symphoricarpos occidentalis* (balsam poplar/buckbrush) community type may be on adjacent sites. Nearby drier communities may include a variety of upland communities.

MANAGEMENT INFORMATION

Livestock

The *Populus balsamifera*/Herbaceous (balsam poplar/Herbaceous) community type provides moderate levels of spring and summer forage. Heavy grazing and trampling tend to maintain the open (park-like) structure of this community type and the continued undergrowth dominance by *Bromus inermis* (awnless brome), *Poa pratensis* (Kentucky bluegrass) *Phleum pratense* (timothy), and a variety of "weedy" forbs. This community type is often used by the ranching community as winter feeding ground. *Bromus inermis* (awnless brome), *Poa pratensis* (Kentucky bluegrass), and, *Phleum pratense* (timothy) are palatable and moderately productive, especially when soil moisture levels are high. They tolerate a high degree of defoliation, and herbage production is moderate. *Poa pratensis* (Kentucky bluegrass) is well adapted to grazing and is considered an increaser or an invader, especially if grazing intensities and durations are severe (Wasser 1982). This species produces new shoots from existing tillers or rhizomes, and grazing practice can influence its growth form (Volland 1978). A high density of weak, low vigour tillers results from season long grazing. Stem densities are emphasized over aboveground biomass. Early season rest increases the vigour of individual plants. Fewer new shoots may be produced, but total aboveground biomass tends to be greater.

Timber

The timber productivity of all cottonwood types is moderate to high due to favourable moisture conditions. Complete stand removal will likely result in a shrub-dominated community with extremely limited, if any, cottonwood regeneration. The occasional sprouts from stumps are unlikely to reach maturity.

Wildlife

This type is a source of early spring forage for deer and elk. Cover value is limited because of the typically open, two layered structure. Many kinds of birds are common since food and cover are available on the ground and in the trees. Great blue herons nest in large cottonwood stands if isolation during the nesting period is possible. Colonial nest sites are used for many years if left undisturbed (Parker 1980). Osprey will also use this type for nesting (Zarn 1974).

Fisheries

The streamside location of this type makes it important in providing thermal cover, debris, and streambank stability. Its importance cannot be emphasized enough (see discussion in the Soil Management and Rehabilitation Opportunities section).

Fire

This type will burn when conditions are dry, such as fall or in late winter if snow accumulations are minimal. The ability of cottonwoods to produce new sprouts following fire seems to be dependent upon three criteria:

1) In general, Populus balsamifera (balsam poplar) has a greater sprouting capability than Populus deltoides (plains cottonwood).
2) The age of the trees. As cottonwoods mature, the sprouting potential decreases. As the trees reach late maturity, sprouting potential is very limited.
3) The location of the water table. In general, the higher the water table is during the growing season, the greater the survivability of resprouts.

Therefore, if a manager wants to extend the life of a cottonwood stand, fire ***MAY BE*** used as a tool in the pole to early mature stage of development. If fire is used to rehabilitate a stand, it is imperative that the stand is excluded from all livestock grazing for at least five years and that wildlife browsing be closely monitored.

Early spring (late March-April) or late-season (late summer-fall) fire can increase *Bromus inermis* (awnless brome) productivity, especially when *Bromus inermis* (awnless brome) has become sod-bound. Late spring fire generally damages cool-season grasses such as *Bromus inermis* (awnless brome) and *Poa pratensis* (Kentucky bluegrass) (USDA IFSL 1995). Intense burns during active growing periods can be used to control stands of *Poa pratensis* (Kentucky bluegrass) (Wasser 1982). Late spring fires, after plants have been growing for about a month or more, are the most damaging to Kentucky bluegrass. Cool fires conducted when plants are dormant have little effect on *Poa pratensis* (Kentucky bluegrass), but it cannot withstand frequent spring burning, and may be eliminated from sites that are burned annually for several years (USDA IFSIL 1995).

Soil Management and Rehabilitation Opportunities

Coarse textured soils are not as susceptible to compaction. This community type is subject to recurring scouring by floods and alluvium deposition. However, stands are relatively stable because of the strong root systems of the associated species. Management should emphasize the importance of the understory shrub layer in streambank stabilization. This is very important on higher gradient streams.

Managers should maintain a buffer of *Populus balsamifera* (balsam poplar) community types adjacent to rivers and streams. These buffers provide wildlife habitat, reduce sediment loading in the stream, stabilize streambanks, and dissipate flood energy.

If the site still has a fairly high water table, a dramatic change in management (i.e. elimination of livestock grazing and close monitoring of wildlife impacts) ***MAY*** allow remnant shrubs to sprout and repopulate the stand. However, if the water table has dropped much, or if the shrubs are completely gone, the opportunity to re-establish an understory of desirable shrubs may have been lost.

Where revegetation with shrubs is the goal, some desirable species such as *Cornus stolonifera* (red-osier dogwood), *Amelanchier alnifolia* (Saskatoon), *Prunus virginiana* (choke cherry), and various species of *Salix* (willows) and *Ribes* (currants and gooseberries) may be well adapted to planting on disturbed sites. Rooted cuttings or nursery grown seedlings are easily established on moist, well-drained soils. Growth rates are rapid and the roots of established seedlings effectively stabilize recently bare soil. Remember: If the canopy cover of trees in the stand has opened up too much and/or the water table has been severely lowered, revegetation success with desirable woody species will be low.

When considering rehabilitation of stands with fire, see the discussion above in the Fire Management section about the inherent problems of fire as a tool for rehabilitation. If fire is to be used to rehabilitate a stand, it is imperative that the stand is excluded from all livestock grazing for at least five years and that browsing by wildlife be closely monitored.

The following guidelines should be followed when attempting to revegetate sites with cuttings from cottonwoods (Swenson 1988):

1) Do not plant cottonwoods on saline or alkaline sites.
2) Select sites with substrates of sand, gravel, or small cobbles. Avoid sites that are classified as clays or have a thick clay layer.
3) Make cuttings from open stands of young, rapidly growing trees. Use only cuttings that are four years old or less. Make cuttings long enough to provide 1 to 2 m (3 to 6 ft) of top length left above the soil surface (see #6 and #7 below). Remove lower

branches, leaving only the tip and top two side branches.

4) Make cuttings when the plants are completely dormant.
5) Soak the cuttings in water for 10 to 14 days.
6) Auger holes to the depth of the lowest anticipated growing season water table level.
7) Place cuttings in the augered holes on the same day they are removed from the soak. Set the butt to the lowest level anticipated that the growing season groundwater would drop.
8) Back fill the holes carefully to avoid leaving air pockets.
9) Place tree guards around the cuttings if rodent or rabbit damage is likely.
10) As buds begin to swell along the cuttings, remove them from the lower two-thirds of the cutting.
11) Plantings must be protected from livestock grazing and big game browsing for two or three growing seasons. Beaver control may also be needed.

Recreational Uses and Considerations

Because of its proximity to streams and rivers and its flat topography, recreational developments and transportation corridors are common within this type. Recreational opportunities are excellent for fishing, big game, and waterfowl hunting, and observing a variety of bird species.

Care must be taken when locating structures within this type. Some campgrounds have been seriously damaged by floods or lost altogether.

OTHER STUDIES

The *Populus balsamifera*/Herbaceous (balsam poplar/Herbaceous) community type is described by Hansen and others (1995) for the mountains, foothills, and intermountain valleys of Montana. Similar communities have been reported for western Montana (Foote 1965), central Oregon (Kovalchik 1987), and central Idaho (Tuhy and Jensen 1982).

Populus balsamifera/Recent Alluvial Bar Community Type
(Balsam Poplar/Recent Alluvial Bar Community Type)

POPUBAL
Number of Stands Sampled = 9
Number of Stands Sampled in Saskatchewan = 1

LOCATION AND ASSOCIATED LANDFORMS

The *Populus balsamifera*/Recent Alluvial Bar (balsam poplar/Recent Alluvial Bar) community type is an incidental to minor type at low to mid elevations in south-central Saskatchewan. In the Prairie Ecozone, this type occurs on alluvial terraces of major streams and rivers, and around lakes and ponds. *Populus balsamifera* (balsam poplar) tends to occur at higher elevations and more northern latitude than *Populus deltoides* (plains cottonwood).

VEGETATION

This type is characterized by domination by seedlings or saplings of *Populus balsamifera* (balsam poplar), or co-domination by the poplar and *Salix exigua* (sandbar willow). *Populus deltoides* (plains cottonwood) may be present but are subordinate to the poplar. A wide variety of herbaceous species can occupy the understory (Table 10).

Table 10. Average canopy cover, range of canopy cover, and constancy for species recorded in 6 stands of the *Populus balsamifera*/Recent Alluvial Bar (balsam poplar/Recent Alluvial Bar) community type that are relatively undisturbed by livestock or wildlife

TABLE 10.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Trees			
Populus angustifolia (narrow-leaf cottonwood)	20	0-20	17
Populus balsamifera (balsam poplar)	43	10-80	100
Shrubs			
Alnus tenuifolia (river alder)	12	0-20	33
Amelanchier alnifolia (Saskatoon)	1	0-1	17
Betula occidentalis (water birch)	3	0-3	17
Clematis ligusticifolia (western clematis)	1	0-1	17
Cornus canadensis (bunchberry)	40	0-40	17
Elaeagnus commutata (silverberry)	3	0-3	17
Prunus virginiana (choke cherry)	1	0-1	33
Rosa woodsii (common wild rose)	3	0-3	17
Rosa spp. (rose)	1	0-1	17
Salix exigua (sandbar willow)	11	0-20	50
Salix lucida (shining willow)	10	0-10	17
Salix lutea (yellow willow)	20	0-20	17
Salix scouleriana (Scouler's willow)	3	0-3	17
Symphoricarpos occidentalis (buckbrush)	1	0-1	17
Graminoids			
Agropyron dasystachyum (northern wheat grass)	10	0-10	17
Agropyron repens (quack grass)	1	0-1	50
Agrostis stolonifera (redtop)	3	0-3	17
Bromus inermis (awnless brome)	3	0-3	17
Calamagrostis canadensis (bluejoint)	15	0-40	50
Elymus virginicus (Virginia wild rye)	1	0-1	17
Phleum pratense (timothy)	1	0-1	17
Poa compressa (Canada bluegrass)	1	0-1	17
Poa palustris (fowl bluegrass)	20	0-20	17
Poa pratensis (Kentucky bluegrass)	1	0-1	33
Forbs			
Apocynum cannabinum (Indian hemp)	3	0-3	17
Arctium minus (common burdock)	1	0-1	17
Aster hesperius (western willow aster)	3	0-3	17
Centaurea maculosa (spotted knapweed)	1	0-1	17
Chenopodium spp. (goosefoot)	1	0-1	17
Cirsium arvense (Canada thistle)	1	0-1	17
Cynoglossum officinale (hound's-tongue)	1	0-1	17
Epilobium angustifolium (common fireweed)	3	0-3	17
Euphorbia esula (leafy spurge)	1	0-1	33
Galium triflorum (sweet-scented bedstraw)	1	0-1	17
Heracleum lanatum (cow parsnip)	20	0-20	17
Lathyrus ochroleucus (cream-colored vetchling)	1	0-1	17
Melilotus alba (white sweet-clover)	5	0-10	33
Melilotus officinalis (yellow sweet-clover)	1	0-1	17
Smilacina stellata (star-flowered Solomon's-seal)	3	0-3	50
Solidago canadensis (Canada goldenrod)	1	0-1	17
Solidago gigantea (late goldenrod)	3	0-3	17
Solidago missouriensis (low goldenrod)	1	0-1	17
Streptopus amplexifolius (clasping-leaved twisted-stalk)	3	0-3	17
Tanacetum vulgare (common tansy)	1	0-1	17
Taraxacum officinale (common dandelion)	1	0-1	50
Thalictrum occidentale (western meadow rue)	40	0-40	17
Thermopsis rhombifolia (golden bean)	1	0-1	17
Tragopogon dubius (common goat's-beard)	1	0-1	17
Vicia americana (wild vetch)	1	0-1	17
Viola spp. (violet)	1	0-1	17
Ferns and Allies			
Equisetum arvense (common horsetail)	2	0-3	33
Equisetum laevigatum (smooth scouring-rush)	1	0-1	17

SUCCESSIONAL INFORMATION

The *Populus balsamifera*/Recent Alluvial Bar (balsam poplar/Recent Alluvial Bar) community type is an early seral (pioneer) stage of primary succession.

Primary Successional Stages

Cottonwoods are a pioneering species that for establishment require moist, barren, newly deposited alluvium that is exposed to full sunlight. In general, these sites represent point bars, side bars, mid channel bars, delta bars, and islands along major streams. Since cottonwoods are a pioneering species, and do not regenerate in their own shade, they are considered a seral species and do not represent the climax vegetation or potential for the site. Many stands may appear to have some limited regeneration, especially in open areas. However, it is important to understand that these young plants represent root sprouts (asexual reproduction), not establishment by seeds (sexual reproduction). These sprouts may prolong the life of the stand, but will not perpetuate it. If the site is left undisturbed, in time the cottonwoods will be replaced by a later successional stage.

Erosion and deposition along a river help maintain plant community diversity on its floodplain. Distribution of the various plant communities depends on the river dynamics. Channel migration rate determines the proportion of floodplain communities in early seral, mid seral, late seral, or climax (PNC) successional stage. If the migration rate is high, few stands progress to late successional stage. Near the outer edges of the floodplain, effect of the river is reduced, allowing more late stages to develop. Lateral movement of the river initiates a dynamic series of vegetation events. The stream erodes its banks on outside curves, typically covered with riparian vegetation in later successional stages. The stream then deposits fresh alluvium on point bars along inside curves. Each new alluvial deposit adds to or forms a distinct band or terrace supporting a vegetation community of a different age. The bands generally are progressively older as one moves away from the channel and onto higher terraces. Parts of the floodplain may remain undisturbed long enough for their elevation to increase enough with respect to the channel that they are rarely, if ever, flooded. These are considered old, mature alluvial terraces, and they may continue development toward climax (PNC) without the modifying influences of floods (Hansen 1989).

Early Seral Stage—The *Populus balsamifera*/Recent Alluvial Bar (balsam poplar/Recent Alluvial Bar) community type is the earliest seral stage of this type.

Mid-Seral Stage—If disturbance (human-caused or natural) does not eliminate the stand, the *Populus balsamifera*/Recent Alluvial Bar (balsam poplar/Recent Alluvial Bar) community type will progress to the relatively undisturbed mid-seral stage, *Populus balsamifera/Cornus stolonifera* (balsam poplar/red-osier dogwood) community type. Normally, the understory under a pole to mature *Populus balsamifera* (balsam poplar) stand is dominated by young plants of other tree species climax to the site, such as *Picea glauca* (white spruce) or *Populus tremuloides* (aspen). If no climax tree species are present, the stand may progress to a tall shrub type dominated by *Salix bebbiana* (beaked willow). As the *Populus balsamifera* (balsam poplar) overstory matures, becomes open, and finally, decadent, these species are ready to replace them.

Late Seral to Climax (PNC) Stage—As the cottonwood stand dies, primary succession toward a climax community progresses unless flooding deposits new sediment suitable for cottonwood seedlings. In the absence of such deposition at an opportune time, succession continues from the *Populus balsamifera/Cornus stolonifera* (balsam poplar/red-osier dogwood) community type to a habitat type dominated by such species as *Picea glauca* (white spruce), *Populus tremuloides* (aspen), or *Salix bebbiana* (beaked willow).

Secondary Successional Stages

The normal primary successional sequence (described above) may be altered due to varying degrees of grazing and browsing pressures. Moderate, prolonged grazing and browsing will shift seral progression to the disturbance-caused *Populus balsamifera/Symphoricarpos occidentalis* (balsam poplar/buckbrush) community type. Severe, prolonged grazing and browsing pressures may eliminate all tree seedlings and even the undergrowth of shrub species as well. This severely disturbed stage of secondary succession is called the *Populus balsamifera*/Herbaceous (balsam poplar/Herbaceous) community type. In this situation, the overstory of *Populus balsamifera* (balsam poplar) still matures and becomes open with an understory dominated by herbaceous species. Finally the stand becomes decadent with widely spaced, dying cottonwoods. The site then is so open and dry that its potential may have changed to one of a variety of upland types.

Stands of the *Populus balsamifera*/Recent Alluvial Bar (balsam poplar/Recent Alluvial Bar) community type are very susceptible to natural river dynamics. They may be flooded and eliminated after just a year or two of growth. Ice can also have a dramatic impact on these recently deposited alluvial bars. Ice can influence the floodplain by: 1) mechanical damage, or 2) flooding (inundation). Mechanical damage generally involves: a) the laying down or bending over of the young cottonwoods, b) the shearing off of the stems, c) the pulling from the ground of the roots by ice that freezes around the stems, and d) the tilting or pushing over of mature trees. Cottonwood seedlings and saplings are very susceptible to defoliation by livestock. If grazing pressure is too great, the stand can be eliminated. In many cases, livestock utilization has eliminated the establishment of new cottonwood stands. Beaver and wild ungulates can also have a dramatic impact on newly established cottonwood stands.

SOILS

Soils are typically Regosols with up to 1 m (39 in) of mineral soil overlying river gravel and/or cobbles. Brunisols and Chernozems can also be found on older sites of relatively longer stability where time has allowed more development to occur. Soil texture varies from loam to coarse sand. Water tables usually drop below 1 m (39 in) of the soil surface in summer, but soils can remain moist due to capillary action. Soils are generally well drained with low available water. Coarse textured soils, moderate stream gradients, and high coarse fragment contents throughout the soil profile provide an environment of rapidly moving, highly aerated groundwater. This type of substrate is common to many floodplain communities.

ADJACENT COMMUNITIES

Adjacent wetter communities are often the *Salix exigua* (sandbar willow) community type or the *Typha latifolia* (common cattail) and *Eleocharis* (spike rush) dominated habitat types. Any of the later seral (older) *Populus balsamifera* (balsam poplar) community types may be adjacent on slightly higher elevations.

MANAGEMENT INFORMATION

Livestock

Forage production is low to moderate in this type. Stands in good to excellent health (condition) often support dense thickets of cottonwoods and associated shrubs, thereby limiting the amount of herbaceous forage. These stands are very susceptible to defoliation by livestock. If establishment of new cottonwood stands is a management objective, livestock impacts should be closely monitored. In some situations, it may be advisable to eliminate livestock use until the cottonwoods have grown out of reach of livestock.

Wildlife

The *Populus balsamifera*/Recent Alluvial Bar (balsam poplar/Recent Alluvial Bar) community type provides valuable cover, shade, and food for a variety of wildlife species. Big game use may be high, depending upon the season. *Populus balsamifera* (balsam poplar) is used by beaver for food and building materials (Allen 1983). Understory species provide food and cover for waterfowl, small birds, and mammals (Dittberner and Olson 1983).

Fisheries

The streamside location of the *Populus balsamifera*/Recent Alluvial Bar (balsam poplar/Recent Alluvial Bar) community type has fisheries value by providing shade and streambank stability.

Fire

The *Populus balsamifera*/Recent Alluvial Bar (balsam poplar/Recent Alluvial Bar) community type is susceptible to fire. In general, cottonwood seedlings, and to a lesser degree, cottonwood saplings lack extensive roots or thick bark, and may therefore be severely damaged (or eliminated) by fire.

Soil Management and Rehabilitation Opportunities

The coarse textured substrates are not susceptible to compaction. This community type is subject to recurrent scouring by floods and alluvium deposition. Managers should maintain a buffer strip of cottonwood dominated community types adjacent streams. These buffer strips filter out sediment, stabilize streambanks, and slow flood waters.

The following guidelines should be followed when attempting to revegetate sites with cuttings from cottonwoods (Swenson 1988):

1) Do not plant cottonwoods on saline or alkaline sites.
2) Select sites with substrates of sand, gravel, or small cobbles. Avoid sites that are classified as clays or have a thick clay layer.
3) Make cuttings from open stands of young, rapidly growing trees. Use only cuttings that are four years old or less. Make cuttings long enough to provide 1 to 2 m (3 to 6 ft) of top length left above the soil surface (see #6 and #7 below). Remove lower branches, leaving only the tip and top two side branches.
4) Make cuttings when the plants are completely dormant.
5) Soak the cuttings in water for 10 to 14 days.
6) Auger holes to the depth of the lowest anticipated growing season water table level.
7) Place cuttings in the augered holes on the same day they are removed from the soak. Set the butt to the lowest level anticipated that the growing season groundwater would drop.
8) Back fill the holes carefully to avoid leaving air pockets.
9) Place tree guards around the cuttings if rodent or rabbit damage is likely.
10) As buds begin to swell along the cuttings, remove them from the lower two-thirds of the cutting.
11) Plantings must be protected from livestock grazing and big game browsing for two or three growing seasons. Beaver control may also be needed.

Recreational Uses and Considerations

Recreational opportunities are excellent for fishing, big game, and waterfowl hunting, and observing a variety of bird species. However, the dense nature of many of these stands may preclude various types of recreational activities such as fly fishing.

OTHER STUDIES

The *Populus balsamifera*/Recent Alluvial Bar (balsam poplar/Recent Alluvial Bar) community type is described by Hansen and others (1995) for the mountains, foothills, and intermountain valleys of Montana.

Populus balsamifera/Symphoricarpos occidentalis Community Type

(Balsam Poplar/Buckbrush Community Type)

POPUBAL/SYMPOCC
Number of Stands Sampled = 21
Number of Stands Sampled in Saskatchewan = 1

LOCATION AND ASSOCIATED LANDFORMS

The *Populus balsamifera/Symphoricarpos occidentalis* (balsam poplar/buckbrush) community type is an incidental to minor type at low to mid elevations in south-central Saskatchewan. In the Prairie Ecozone, this type occurs on alluvial terraces of major streams and rivers, and around lakes and ponds. *Populus balsamifera* (balsam poplar) tends to occur at higher elevations and more northern latitude than *Populus deltoides* (plains cottonwood).

VEGETATION

The *Populus balsamifera/Symphoricarpos occidentalis* (balsam poplar/buckbrush) community type represents a grazing disclimax, where the more palatable shrubs, such as *Salix* (willows) and *Cornus stolonifera* (red-osier dogwood), have been eliminated from the site. This type is characterized by an overstory of cottonwoods over a potentially dense and diverse group of undergrowth shrubs and herbaceous plants. *Populus deltoides* (plains cottonwood) may be present but is subordinate to *Populus balsamifera* (balsam poplar).

The type is characterized by an overstory of *Populus balsamifera* (balsam poplar) over an understory dominated by *Symphoricarpos occidentalis* (buckbrush) and/or *Rosa woodsii* (common wild rose) (Table 11).

Table 11. Average canopy cover, range of canopy cover, and constancy for those species recorded in 21 stands sampled of the grazing or browsing disclimax *Populus balsamifera/Symphoricarpos occidentalis* (balsam poplar/buckbrush) community type

TABLE 11.	**% Can. Cov.**		
Species	**Avg.**	**Rng.**	**Con.**
Trees			
Betula papyrifera (white birch)	3	0-3	5
Picea spp. (spruce)	1	0-1	5
Picea glauca (white spruce)	1	0-3	14
Populus angustifolia (narrow-leaf cottonwood)	20	0-20	5
Populus balsamifera (balsam poplar)	60	30-90	100
Populus tremuloides (aspen)	1	0-3	19
Pseudotsuga menziesii (Douglas-fir)	3	0-3	5
Shrubs			
Alnus tenuifolia (river alder)	5	0-10	10
Amelanchier alnifolia (Saskatoon)	7	0-60	62
Arctostaphylos uva-ursi (common bearberry)	1	0-1	10
Betula occidentalis (water birch)	10	0-20	10
Clematis occidentalis (purple clematis)	1	0-1	5
Cornus stolonifera (red-osier dogwood)	1	0-1	24
Corylus cornuta (beaked hazelnut)	10	0-10	5
Crataegus douglasii (Douglas hawthorn)	55	0-90	10
Crataegus rotundifolia (round-leaved hawthorn)	20	0-20	5
Dryas drummondii (yellow mountain avens)	10	0-10	5
Elaeagnus commutata (silverberry)	16	0-30	33
Juniperus communis (ground juniper)	1	0-1	5
Linnaea borealis (twinflower)	1	0-1	5
Lonicera involucrata (bracted honeysuckle)	1	0-1	14
Potentilla fruticosa (shrubby cinquefoil)	1	0-3	19
Prunus virginiana (choke cherry)	5	0-10	29
Rhus radicans (poison ivy)	1	0-1	5
Ribes inerme (mountain gooseberry)	3	0-3	5
Ribes oxyacanthoides (northern gooseberry)	4	0-20	38
Ribes spp. (currant)	1	0-1	5

TABLE 11.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Rosa woodsii (common wild rose)	24	0-50	38
Rosa spp. (rose)	11	0-30	48
Rubus arcticus (dwarf raspberry)	1	0-1	5
Rubus idaeus (wild red raspberry)	5	0-20	19
Rubus parviflorus (thimbleberry)	20	0-20	10
Salix bebbiana (beaked willow)	5	0-20	29
Salix boothii (Booth's willow)	2	0-3	10
Salix drummondiana (Drummond's willow)	1	0-1	10
Salix exigua (sandbar willow)	3	0-3	10
Salix lutea (yellow willow)	10	0-20	10
Salix melanopsis (willow)	1	0-1	5
Salix myrtillifolia (myrtle-leaved willow)	1	0-1	10
Salix pseudomonticola (false mountain willow)	7	0-10	10
Shepherdia canadensis (Canada buffaloberry)	5	0-10	29
Spiraea betulifolia (white meadowsweet)	1	0-1	10
Symphoricarpos albus (snowberry)	1	0-1	5
Symphoricarpos occidentalis (buckbrush)	10	0-30	76
Graminoids			
Agropyron spp. (wheat grass)	1	0-1	5
Agropyron repens (quack grass)	2	0-3	10
Agropyron smithii (western wheat grass)	15	0-20	10
Agrostis spp. (Agrostis)	3	0-3	5
Agrostis stolonifera (redtop)	60	0-60	5
Agropyron trachycaulum (slender wheat grass)	3	0-3	19
Bromus anomalus (nodding brome)	1	0-1	5
Bromus carinatus (keeled brome)	2	0-3	10
Bromus ciliatus (fringed brome)	2	0-3	14
Bromus inermis (awnless brome)	17	0-40	33
Bromus spp. (brome)	3	0-3	5
Calamagrostis canadensis (bluejoint)	2	0-3	10
Carex microglochin (short-awned sedge)	1	0-1	10
Carex praegracilis (graceful sedge)	3	0-3	5
Carex rostrata (beaked sedge)	1	0-1	5
Carex sprengelii (Sprengel's sedge)	3	0-3	10
Deschampsia cespitosa (tufted hair grass)	1	0-1	5
Eleocharis compressa (flattened spike-rush)	3	0-3	5
Elymus glaucus (smooth wild rye)	10	0-20	10
Festuca rubra (red fescue)	3	0-3	10
Unknown Grass	3	0-3	5
Hierochloe odorata (sweet grass)	1	0-1	5
Juncus balticus (wire rush)	1	0-1	5
Phleum pratense (timothy)	18	0-80	43
Poa compressa (Canada bluegrass)	3	0-3	5
Poa cusickii (early bluegrass)	1	0-1	5
Poa nervosa (Wheeler's bluegrass)	3	0-3	5
Poa palustris (fowl bluegrass)	2	0-3	19
Poa pratensis (Kentucky bluegrass)	22	0-50	76
Stipa comata (needle-and-thread)	20	0-20	5
Stipa viridula (green needle grass)	3	0-3	5
Forbs			
Achillea millefolium (common yarrow)	2	0-3	43
Actaea rubra (red and white baneberry)	1	0-3	14
Agrimonia striata (agrimony)	3	0-3	5
Allium cernuum (nodding onion)	1	0-1	10
Allium spp. (onion)	1	0-1	5
Anemone cylindrica (long-fruited anemone)	1	0-1	14
Anemone multifida (cut-leaved anemone)	1	0-1	5
Angelica arguta (white angelica)	1	0-1	10
Artemisia campestris (plains wormwood)	1	0-1	5
Artemisia ludoviciana (prairie sagewort)	1	0-1	5
Aster ascendens (western aster)	1	0-1	5
Aster ciliolatus (Lindley's aster)	10	0-10	5
Aster conspicuus (showy aster)	1	0-1	10
Aster hesperius (western willow aster)	7	0-10	10
Aster laevis (smooth aster)	3	0-10	24
Aster puniceus (purple-stemmed aster)	1	0-1	5
Aster spp. (aster)	1	0-1	10
Aster subspicatus (leafy-bracted aster)	3	0-3	19
Astragalus americanus (American milk vetch)	1	0-1	5
Athyrium filix-femina (lady fern)	3	0-3	5
Campanula rotundifolia (harebell)	1	0-1	10
Castilleja coccinea (scarlet paintbrush)	1	0-1	5
Castilleja spp. (paintbrush)	1	0-1	10
Castilleja miniata (common red paintbrush)	3	0-3	5

TABLE 11.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Chrysanthemum leucanthemum (ox-eye daisy)	1	0-1	10
Cirsium arvense (Canada thistle)	5	0-10	14
Cirsium spp. (thistle)	1	0-1	5
Disporum trachycarpum (fairybells)	3	0-3	5
Epilobium angustifolium (common fireweed)	1	0-3	24
Erigeron spp. (erigeron)	1	0-1	5
Erigeron speciosus (showy fleabane)	1	0-1	5
Euphorbia esula (leafy spurge)	1	0-1	5
Fragaria virginiana (wild strawberry)	2	0-3	43
Galium aparine (cleavers)	1	0-1	5
Galium boreale (northern bedstraw)	3	0-10	24
Galium triflorum (sweet-scented bedstraw)	1	0-3	19
Geranium spp. (geranium)	1	0-1	5
Geranium richardsonii (wild white geranium)	6	0-10	19
Geranium viscosissimum (sticky purple geranium)	1	0-1	5
Geum macrophyllum (large-leaved yellow avens)	1	0-1	5
Glycyrrhiza lepidota (wild licorice)	1	0-1	5
Hackelia jessicae (Jessica's stickseed)	1	0-1	5
Heracleum lanatum (cow parsnip)	2	0-3	14
Heterotheca villosa (golden aster)	1	0-1	5
Hieracium umbellatum (narrow-leaved hawkweed)	1	0-1	10
Lathyrus ochroleucus (cream-colored vetchling)	6	0-30	33
Linaria vulgaris (butter-and-eggs)	1	0-1	5
Linum lewisii (wild blue flax)	1	0-1	5
Melilotus alba (white sweet-clover)	2	0-3	10
Melilotus officinalis (yellow sweet-clover)	1	0-1	5
Mentha arvensis (wild mint)	1	0-1	5
Mertensia spp. (bluebell)	1	0-1	5
Mertensia paniculata (tall lungwort)	2	0-3	14
Monarda fistulosa (wild bergamot)	1	0-1	10
Montia spp. (montia)	1	0-1	5
Osmorhiza chilensis (blunt-fruited sweet cicely)	5	0-10	14
Osmorhiza depauperata (spreading sweet cicely)	1	0-3	14
Osmorhiza occidentalis (western sweet cicely)	20	0-20	5
Petasites palmatus (palmate-leaved coltsfoot)	3	0-3	5
Potentilla gracilis (graceful cinquefoil)	1	0-1	10
Pyrola asarifolia (common pink wintergreen)	4	0-10	14
Sanicula marilandica (snakeroot)	1	0-1	10
Senecio pauperculus (balsam groundsel)	1	0-3	19
Senecio pseudaureus (thin-leaved ragwort)	12	0-20	10
Smilacina stellata (star-flowered Solomon's-seal)	3	0-20	67
Solidago canadensis (Canada goldenrod)	4	0-10	14
Solidago gigantea (late goldenrod)	2	0-3	10
Solidago graminifolia (flat-topped goldenrod)	1	0-1	5
Solidago missouriensis (low goldenrod)	5	0-20	24
Sonchus arvensis (perennial sow-thistle)	1	0-3	14
Taraxacum ceratophorum (northern dandelion)	1	0-1	5
Taraxacum officinale (common dandelion)	3	0-20	57
Thalictrum dasycarpum (tall meadow rue)	3	0-3	5
Thalictrum occidentale (western meadow rue)	28	0-80	19
Thalictrum venulosum (veiny meadow rue)	1	0-1	24
Thermopsis rhombifolia (golden bean)	5	0-10	14
Trifolium spp. (clover)	1	0-1	5
Trifolium pratense (red clover)	20	0-20	5
Trifolium repens (white clover)	13	0-40	24
Urtica dioica (common nettle)	2	0-3	10
Vicia americana (wild vetch)	3	0-3	29
Viola adunca (early blue violet)	1	0-1	10
Viola spp. (violet)	12	0-20	10
Viola canadensis (western Canada violet)	1	0-1	14
Ferns and Allies			
Equisetum arvense (common horsetail)	11	0-50	33

SUCCESSIONAL INFORMATION

The *Populus balsamifera/Symphoricarpos occidentalis* (balsam poplar/buckbrush) community type represents a moderately disturbed secondary successional stage of the mid-seral *Populus balsamifera/Cornus stolonifera* (balsam poplar/red-osier dogwood) community type.

Primary Successional Stages

Cottonwoods are a pioneering species that for establishment require moist, barren, newly deposited alluvium that is exposed to full sunlight. In general, these sites represent point bars, side bars, mid channel bars, delta bars, and islands along major streams. Since cottonwoods are a pioneering species, and do not regenerate in their own shade, they are considered a seral species and do not represent the climax vegetation or potential for the site. Many stands may appear to have some limited regeneration, especially in open areas. However, it is important to understand that these young plants represent root sprouts (asexual reproduction), not establishment by seeds (sexual reproduction). These sprouts may prolong the life of the stand, but will not perpetuate it. If the site is left undisturbed, in time the cottonwoods will be replaced by a later successional stage.

Erosion and deposition along a river help maintain plant community diversity on its floodplain. Distribution of the various plant communities depends on the river dynamics. Channel migration rate determines the proportion of floodplain communities in early seral, mid seral, late seral, or climax (PNC) successional stage. If the migration rate is high, few stands progress to late successional stage. Near the outer edges of the floodplain, effect of the river is reduced, allowing more late stages to develop. Lateral movement of the river initiates a dynamic series of vegetation events. The stream erodes its banks on outside curves, typically covered with riparian vegetation in later successional stages. The stream then deposits fresh alluvium on point bars along inside curves. Each new alluvial deposit adds to or forms a distinct band or terrace supporting a vegetation community of a different age. The bands generally are progressively older as one moves away from the channel and onto higher terraces. Parts of the floodplain may remain undisturbed long enough for their elevation to increase enough with respect to the channel that they are rarely, if ever, flooded. These are considered old, mature alluvial terraces, and they may continue development toward climax (PNC) without the modifying influences of floods (Hansen 1989).

Early Seral Stage—The *Populus balsamifera*/Recent Alluvial Bar (balsam poplar/Recent Alluvial Bar) community type is the earliest seral stage of this type.

Mid-Seral Stage—If disturbance (human-caused or natural) does not eliminate the stand, the *Populus balsamifera*/Recent Alluvial Bar (balsam poplar/Recent Alluvial Bar) community type will progress to the relatively undisturbed mid-seral stage, *Populus balsamifera/Cornus stolonifera* (balsam poplar/red-osier dogwood) community type. Normally, the understory under a pole to mature *Populus balsamifera* (balsam poplar) stand is dominated by young plants of other tree species climax to the site, such as *Picea glauca* (white spruce) or *Populus tremuloides* (aspen). If no climax tree species are present, the stand may progress to a tall shrub type dominated by *Salix bebbiana* (beaked willow). As the *Populus balsamifera* (balsam poplar) overstory matures, becomes open, and finally, decadent, these species are ready to replace them.

Late Seral to Climax (PNC) Stage—As the cottonwood stand dies, primary succession toward a climax community progresses unless flooding deposits new sediment suitable for cottonwood seedlings. In the absence of such deposition at an opportune time, succession continues from the *Populus* *balsamifera/Cornus stolonifera* (balsam poplar/red-osier dogwood) community type to a habitat type dominated by such species as *Picea glauca* (white spruce), *Populus tremuloides* (aspen), or *Salix bebbiana* (beaked willow).

Secondary Successional Stages

The presence or absence of a particular understory community may aid in determining degree of disturbance (present and historical) on a site. On relatively undisturbed sites, the *Populus balsamifera* (balsam poplar) understory will contain a diverse, dense shrub layer dominated by *Cornus stolonifera* (red-osier dogwood), *Amelanchier alnifolia* (Saskatoon), *Prunus virginiana* (choke cherry), various *Salix* species (willows), and *Ribes* species (currants and gooseberries).

With moderate grazing or browsing, *Symphoricarpos occidentalis* (buckbrush) and *Rosa* species (rose) will increase with a corresponding decrease in abundance and canopy cover of *Cornus stolonifera* (red-osier dogwood), *Amelanchier alnifolia* (Saskatoon), *Prunus virginiana* (choke cherry), and *Ribes* (currants and gooseberries). If grazing or browsing pressures continue, the more desirable shrubs will be eliminated, leaving *Symphoricarpos occidentalis* (buckbrush) and *Rosa* species (rose) to form a nearly impenetrable understory. This is the *Populus balsamifera/Symphoricarpos occidentalis* (balsam poplar/buckbrush) community type stage of disturbance-caused secondary succession. If the disturbance is severe enough, ***ALL*** shrubs can be eliminated and the understory converted to herbaceous, dominated by species such as *Poa pratensis* (Kentucky bluegrass), *Phleum pratense* (timothy), *Bromus inermis* (awnless brome), and a variety of "weedy" forbs. This extremely disturbed stage is the *Populus balsamifera*/Herbaceous (balsam poplar/Herbaceous) community type.

During the process of converting from a naturally diverse, dense shrub understory to a disturbed herbaceous understory, the stand will open underneath, causing it to become drier. Finally the stand becomes decadent with widely spaced, dying cottonwoods. The site can become open and dry enough to change the potential to an upland type, as indicated by the presence of upland species. Such conversion may be slow due to persistence of some of the sod forming grasses. Remnant riparian shrubs and graminoids, if present will help indicate potential undergrowth composition.

Once the stand has converted from a shrub-dominated understory to one dominated by introduced herbaceous species, the potential for returning the site to its former state (shrub dominated) is very difficult. It may be possible, but will require a drastic change in management and may be very costly. Therefore, if a manager wants to maintain the shrub-dominated understory, the most cost effective way is to change the management ***BEFORE*** the site is too degraded.

SOILS

Soils are typically Regosols with up to 1 m (39 in) of mineral soil overlying river gravel and/or cobbles. Brunisols and Chernozems can also be found on older sites of relatively longer stability where time has allowed more development to occur. Soil texture varies from loam to coarse sand. Water tables usually drop below 1 m (39 in) of the soil surface in summer, but soils can remain moist due to capillary action. Redox concentrations (mottles) are common in these soils as evidence of a fluctuating water table. Soils are generally well drained with low available water. Coarse textured soils, moderate stream gradients, and high coarse fragment contents throughout the soil profile provide an environment of rapidly moving, highly aerated groundwater. This type of substrate is common to many floodplain communities.

ADJACENT COMMUNITIES

Adjacent wetter communities are often the *Salix exigua* (sandbar willow) community type or the *Typha latifolia* (common cattail) and *Eleocharis* (spike rush) dominated habitat types. The *Populus balsamifera/Cornus stolonifera* (balsam poplar/red-osier dogwood) or the *Populus balsamifera*/Herbaceous (balsam poplar/Herbaceous) community types may be on adjacent sites, or there may be a variety of upland species on adjacent drier sites.

MANAGEMENT INFORMATION

Livestock

Forage production ranges from low to moderate in the dense shrub understory in these stands. Forage production in dense thickets of *Symphoricarpos occidentalis* (buckbrush) and *Rosa* species (rose) is low. Stands may be so dense that they prevent most livestock use. If the shrub understory is reduced by continual prolonged grazing or browsing, stands open and forage production increases due to the disturbance-caused increase of *Poa pratensis* (Kentucky bluegrass), *Phleum pratense* (timothy), and/or *Bromus inermis* (awnless brome). The palatability of *Symphoricarpos occidentalis* (buckbrush) ranges from low to fair for cattle and somewhat higher for sheep (Wasser 1982, Johnson and Nichols 1982, Harrison 2000), and the leaves of *Rosa woodsii* (common wild rose) are considered fair to fairly good livestock forage, particularly for sheep (Johnson and Nichols 1982).

Timber

The timber productivity of all cottonwood types is moderate to high due to favourable moisture conditions. Complete stand removal will likely result in a shrub-dominated community with extremely limited, if any, cottonwood regeneration. The occasional sprouts from stumps are unlikely to reach maturity.

Wildlife

The *Populus balsamifera/Symphoricarpos occidentalis* (balsam poplar/buckbrush) community type provides valuable cover, shade, and food for a variety of species. Big game use may be high, depending upon the time of year. The spreading crown of *Populus balsamifera* (balsam poplar) provides sites for huge platform-like stick nests of bald eagles and ospreys (Arno and Hammerly 1984) and for great blue herons (Parker 1980). Canada geese occasionally use the nests previously built by bald eagles and osprey. A variety of birds and mammals, such as woodpeckers, great horned owls, wood ducks, and raccoons, nest in trunk cavities. *Populus balsamifera* (balsam poplar) and *Rosa woodsii* (common wild rose) are used by beaver for food and building materials (Allen 1983). Understory species provide food and cover for waterfowl, small birds, and mammals (Dittberner and Olson 1983).

The moderate structural understory diversity of *Symphoricarpos occidentalis* (buckbrush) and *Rosa* species (rose) provides thermal and hiding cover for big game and upland bird species. The palatability of *Symphoricarpos occidentalis* (buckbrush) is rated as good for deer and elk (Wasser 1982, Johnson and Nichols 1982). Deer and elk may browse heavily on *Rosa woodsii* (common wild rose), while the persistent fruit (rose hips) provides fall and winter food for birds, small mammals, and bears, which disperse the seeds. *Rosa woodsii* (common wild rose) is strongly grazing tolerant but can be dwarfed and thinned by intense browsing or defoliation by season long use.

Fisheries

The streamside location of the *Populus balsamifera/Symphoricarpos occidentalis* (balsam poplar/buckbrush) community type makes it very important in providing thermal cover, debris, and streambank stability. Its importance cannot be emphasized enough (see discussion in the Soil

Management and Rehabilitation Opportunities section). *Symphoricarpos occidentalis* (buckbrush) and *Rosa woodsii* (common wild rose) are excellent in controlling erosion along streams due to their rhizomatous nature. This is particularly important on higher gradient streams where scouring by seasonal flooding is possible.

Fire

The *Populus balsamifera/Symphoricarpos occidentalis* (balsam poplar/buckbrush) community type is susceptible to fire during the late summer and fall. Many of these species can produce new sprouts after a burn. The ability of cottonwoods to produce new sprouts following fire seems to be dependent upon three criteria:

1) In general, Populus balsamifera (balsam poplar) has a greater sprouting capability than Populus deltoides (plains cottonwood).
2) The age of the trees. As cottonwoods mature, the sprouting potential decreases. As the trees reach late maturity, sprouting potential is very limited.
3) The location of the water table. In general, the higher the water table is during the growing season, the greater the survivability of resprouts.

Therefore, if a manager wants to extend the life of a cottonwood stand, fire ***MAY BE*** used as a tool in the pole to early mature stage of development. If fire is used to rehabilitate a stand, it is imperative that the stand is excluded from all livestock grazing for at least five years and that wildlife browsing be closely monitored.

Symphoricarpos occidentalis (buckbrush) is tolerant of fire. It can be injured by fire, but it usually sprouts, with stands becoming denser afterward. It is such a strong competitor, particularly in dense colonies, that it is not very compatible with most herbaceous vegetation. *Rosa woodsii* (common wild rose) is typically top-killed by fire, but root crowns and underground rhizomes survive low- or moderate-severity fires. However, the shallow root crowns of *Rosa woodsii* (common wild rose) are susceptible to injury, and populations consequently decrease following high-severity fire. *Rosa woodsii* (common wild rose) recovery varies with fire severity. Top-killed plants will sprout from the root crown and underground surviving rhizomes (USDA IFSL 1995).

Soil Management and Rehabilitation Opportunities

Coarse textured soils are not as susceptible to compaction. This community type is subject to recurring scouring by floods and alluvium deposition. However, stands are relatively stable because of the strong root systems of the associated species. Management should emphasize the importance of the understory shrub layer in streambank stabilization. This is very important on higher gradient streams.

Managers should maintain a buffer of *Populus balsamifera* (balsam poplar) community types adjacent to rivers and streams. These buffers provide wildlife habitat, reduce sediment loading in the stream, stabilize streambanks, and dissipate flood energy.

If the site still has a fairly high water table, a dramatic change in management (i.e. elimination of livestock grazing and close monitoring of wildlife impacts) ***MAY*** allow remnant shrubs to sprout and repopulate the stand. However, if the water table has dropped much, or if the shrubs are completely gone, the opportunity to re-establish an understory of desirable shrubs may have been lost.

Where revegetation with shrubs is the goal, some desirable species such as *Cornus stolonifera* (red-osier dogwood), *Amelanchier alnifolia* (Saskatoon), *Prunus virginiana* (choke cherry), and various species of *Salix* (willows) and *Ribes* (currants and gooseberries) may be well adapted to planting on disturbed sites. Rooted cuttings or nursery grown seedlings are easily established on moist, well-drained soils. Growth rates are rapid and the roots of established seedlings effectively stabilize recently bare soil. Remember: If the canopy cover of trees in the stand has opened up too much and/or the water table has been severely lowered, revegetation success with desirable woody species will be low.

When considering rehabilitation of stands with fire, see the discussion above in the Fire Management section about the inherent problems of fire as a tool for rehabilitation. If fire is to be used to rehabilitate a stand, it is imperative that the stand is excluded from all livestock grazing for at least five years and that browsing by wildlife be closely monitored.

The following guidelines should be followed when attempting to revegetate sites with cuttings from cottonwoods (Swenson 1988):

1) Do not plant cottonwoods on saline or alkaline sites.
2) Select sites with substrates of sand, gravel, or small cobbles. Avoid sites that are classified as clays or have a thick clay layer.
3) Make cuttings from open stands of young, rapidly growing trees. Use only cuttings that are four years old or less. Make cuttings long enough to provide 1 to 2 m (3 to 6 ft) of top length left above the soil surface (see #6 and #7 below). Remove lower branches, leaving only the tip and top two side branches.
4) Make cuttings when the plants are completely dormant.
5) Soak the cuttings in water for 10 to 14 days.
6) Auger holes to the depth of the lowest anticipated growing season water table level.
7) Place cuttings in the augered holes on the same day they are removed from the soak. Set the butt to the lowest level anticipated that the growing season groundwater would drop.
8) Back fill the holes carefully to avoid leaving air pockets.
9) Place tree guards around the cuttings if rodent or rabbit damage is likely.
10) As buds begin to swell along the cuttings, remove them from the lower two-thirds of the cutting.
11) Plantings must be protected from livestock grazing and big game browsing for two or three growing seasons. Beaver control may also be needed.

Symphoricarpos occidentalis (buckbrush) is well adapted for revegetating disturbed sites due to its habit of growing in dense clonal stands. It does best on moist, well-drained soils, which have not been excessively disturbed. Once established, it grows at a moderate rate and spreads rapidly by root sprouts. Nursery grown seedlings, rooted cuttings, or wildlings are the preferred planting materials. Critical, erodible sites may require that grazing be completely excluded during establishment Animal populations and stacking rates should be balanced with forage supply on noncritical sites after establishment (Wasser 1982).

Rosa woodsii (common wild rose) is valuable for revegetating disturbed sites along streambanks and seeps. It is easily established from nursery grown stock, root cuttings, or transplanting.

Recreational Uses and Considerations

Because of its proximity to streams and rivers and its flat topography, recreational developments and transportation corridors are common within this type. Recreational opportunities are excellent for fishing, big game, and waterfowl hunting, and observing a variety of bird species.

Care must be taken when locating structures within this type. Some campgrounds in Montana have been seriously damaged by floods or lost altogether.

Symphoricarpos occidentalis (buckbrush) is an important food source for upland birds due to fruits that persist into the winter. The persistent rose hips are edible, and are one of the best natural sources of vitamin C. They can be dried for use in flavouring teas, jellies, fruitcakes, and puddings.

Nature trails should be routed around dense stands of *Rosa woodsii* (common wild rose) community type. However, *Rosa woodsii* (common wild rose) is useful for planting in recreation areas as a biological barrier to protect physical structures, young and delicate plants, and to direct traffic.

OTHER STUDIES

The *Populus balsamifera/Symphoricarpos occidentalis* (balsam poplar/buckbrush) community type is described by Hansen and others (1995) for the mountains, foothills, and intermountain valleys of Montana. Similar communities have been reported for western Montana (Foote 1965), central Oregon (Kovalchik 1987), and central Idaho (Tuhy and Jensen 1982).

Populus deltoides/Cornus stolonifera Community Type (Plains Cottonwood/Red-Osier Dogwood Community Type)

POPUDEL/CORNSTO

Number of Stands Sampled = 17

Number of Stands Sampled in Saskatchewan = 1

LOCATION AND ASSOCIATED LANDFORMS

The *Populus deltoides/Cornus stolonifera* (plains cottonwood/red-osier dogwood) community type is a minor type at low elevations in the southern part of the Grassland Ecoregions in Saskatchewan. The type occurs on older alluvial bars of major streams and rivers, and around lakes and ponds. *Populus deltoides* (plains cottonwood) is found at the lowest elevation of the two cottonwood species occurring in Saskatchewan. Stands may be extensive on major river floodplain terraces, such as along the South Saskatchewan River.

VEGETATION

The *Populus deltoides/Cornus stolonifera* (plains cottonwood/red-osier dogwood) community type is characterized by an overstory of *Populus deltoides* (plains cottonwood) over a dense, diverse understory of shrubs and herbs. In relatively undisturbed stands, the shrub layer includes *Cornus stolonifera* (red-osier dogwood), *Salix lutea* (yellow willow), and *Prunus virginiana* (choke cherry). The herbaceous layer may contain *Solidago canadensis* (Canada goldenrod) and *Smilacina stellata* (star-flowered Solomon's-seal) (Table 12).

Table 12. Average canopy cover, range of canopy cover, and constancy for species recorded in 10 stands of the *Populus deltoides/Cornus stolonifera* (plains cottonwood/red-osier dogwood) community type that are relatively undisturbed by livestock or wildlife

TABLE 12.	**% Can. Cov.**		
Species	**Avg.**	**Rng.**	**Con.**
Trees			
Fraxinus pennsylvanica (green ash)	2	0-3	20
Populus x acuminata (lance-leaf cottonwood)	90	0-90	10
Populus angustifolia (narrow-leaf cottonwood)	20	0-20	10
Populus balsamifera (balsam poplar)	25	0-40	20
Populus deltoides (plains cottonwood)	62	0-90	90
Shrubs			
Alnus tenuifolia (river alder)	10	0-10	10
Amelanchier alnifolia (Saskatoon)	1	0-1	20
Betula occidentalis (water birch)	1	0-1	10
Clematis ligusticifolia (western clematis)	3	0-3	10

TABLE 12.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Cornus stolonifera (red-osier dogwood)	50	3-98	100
Prunus virginiana (choke cherry)	12	0-40	40
Rhus trilobata (skunkbush)	1	0-1	10
Ribes aureum (golden currant)	2	0-3	20
Ribes oxyacanthoides (northern gooseberry)	1	0-1	10
Rosa spp. (rose)	11	0-30	90
Salix amygdaloides (peach-leaved willow)	3	0-3	10
Salix exigua (sandbar willow)	40	0-80	20
Salix lutea (yellow willow)	19	0-60	90
Shepherdia argentea (thorny buffaloberry)	1	0-1	10
Symphoricarpos occidentalis (buckbrush)	2	0-3	60
Graminoids			
Agropyron dasystachyum (northern wheat grass)	50	0-50	10
Agropyron repens (quack grass)	20	0-20	10
Agropyron smithii (western wheat grass)	10	0-10	10
Agropyron trachycaulum (slender wheat grass)	1	0-1	10
Bromus inermis (awnless brome)	27	0-50	30
Carex lanuginosa (woolly sedge)	2	0-3	20
Carex sprengelii (Sprengel's sedge)	1	0-1	10
Elymus canadensis (Canada wild rye)	1	0-1	20
Hordeum jubatum (foxtail barley)	20	0-20	10
Muhlenbergia racemosa (marsh muhly)	1	0-1	10
Forbs			
Anemone cylindrica (long-fruited anemone)	10	0-10	10
Apocynum cannabinum (Indian hemp)	3	0-3	10
Apocynum spp. (dogbane)	3	0-3	10
Aralia nudicaulis (wild sarsaparilla)	10	0-10	10
Artemisia absinthium (absinthe wormwood)	1	0-1	10
Aster ericoides (tufted white prairie aster)	1	0-1	10
Cirsium arvense (Canada thistle)	3	0-3	10
Clintonia uniflora (corn lily)	1	0-1	10
Euphorbia esula (leafy spurge)	20	0-20	10
Galium triflorum (sweet-scented bedstraw)	2	0-3	20
Geranium richardsonii (wild white geranium)	3	0-3	10
Glycyrrhiza lepidota (wild licorice)	7	0-20	30
Lysimachia ciliata (fringed loosestrife)	10	0-10	10
Melilotus alba (white sweet-clover)	12	0-20	20
Monarda fistulosa (wild bergamot)	1	0-1	10
Smilacina stellata (star-flowered Solomon's-seal)	11	0-40	60
Solidago canadensis (Canada goldenrod)	22	0-60	60
Taraxacum officinale (common dandelion)	1	0-1	20
Thalictrum occidentale (western meadow rue)	1	0-1	10
Thermopsis rhombifolia (golden bean)	1	0-1	10
Vicia americana (wild vetch)	2	0-3	40

SUCCESSIONAL INFORMATION

The *Populus deltoides/Cornus stolonifera* (plains cottonwood/red-osier dogwood) community type is a mid-seral stage of primary succession.

Primary Successional Stages

Cottonwoods are a pioneering species that for establishment require moist, barren, newly deposited alluvium that is exposed to full sunlight. In general, these sites represent point bars, sidebars, mid channel bars, delta bars, and islands along major streams. Since cottonwoods are a pioneering species, and do not regenerate in their own shade, they are considered a seral species and do not represent the climax vegetation or potential for the site. Many stands may appear to have some limited regeneration, especially in open areas. However, it is important to understand that these young plants represent root sprouts (asexual reproduction), not establishment by seeds (sexual reproduction). These sprouts may prolong the life of the stand, but will not perpetuate it. If the site is left undisturbed, in time the cottonwoods will be replaced by a later successional stage.

Erosion and deposition along a river help maintain plant community diversity on its floodplain. Distribution of the various plant communities depends on the river dynamics. Channel migration rate determines the proportion of floodplain communities in early seral, mid seral, late seral, or climax (PNC) successional stage. If the migration rate is high, few stands progress to late successional stage. Near the outer edges of the floodplain, effect of the river is reduced, allowing more late stages to develop. Lateral movement of the river initiates a dynamic series of vegetation events. The stream erodes its banks on outside curves, typically covered with riparian vegetation in later successional stages. The stream then deposits fresh alluvium on point bars along inside curves. Each new alluvial deposit adds to or forms a distinct band or terrace supporting a vegetation community of a different age. The bands generally are progressively older as one moves away from the channel and onto higher terraces. Parts of the floodplain may remain undisturbed long enough for their elevation to increase enough with respect to the channel that they are rarely, if ever, flooded. These are considered old, mature alluvial terraces, and they may continue development toward climax (PNC) without the modifying influences of floods (Hansen 1989).

Early Seral Stage—The *Populus deltoides*/Recent Alluvial Bar (plains cottonwood/Recent Alluvial Bar) community type is the initial seral stage of this type.

Mid-Seral Stage—If disturbance (human-caused or natural) does not alter or eliminate the stand, the *Populus deltoides*/Recent Alluvial Bar (plains cottonwood/Recent Alluvial Bar) community type will progress to the mid-seral stage *Populus deltoides/Cornus stolonifera* (plains cottonwood/red-osier dogwood) community type. The understory of pole to mature *Populus deltoides* (plains cottonwood) may be dominated by young *Acer negundo* (Manitoba maple), or in some cases, *Fraxinus pennsylvanica* (green ash) trees.

Late Seral to Climax (PNC) Stage—As the cottonwood stand dies, primary succession toward later seral communities will occur unless a flood deposits new sediment suitable for cottonwood seedlings. In the absence of this event, succession continues from the *Populus deltoides/Cornus stolonifera* (plains cottonwood/red-osier dogwood) community type toward some habitat type (potential vegetation of the site). If the cottonwood understory has *Acer negundo* (Manitoba maple) or *Fraxinus pennsylvanica* (green ash) present as the *Populus deltoides* (plains cottonwood) overstory matures, becomes open, and then decadent, the *Acer negundo* (Manitoba maple) or *Fraxinus pennsylvanica* (green ash) will replace the cottonwoods. The stand then goes to the *Acer negundo/Prunus virginiana* (Manitoba maple/choke cherry) or the *Fraxinus pennsylvanica/Prunus virginiana* (green ash/choke cherry) habitat type. In many cases when no climax tree species are present, the cottonwood mid seral stage will progress to a shrub habitat type, such as the *Salix lutea/Cornus stolonifera* (yellow willow/red-osier dogwood) habitat type or the *Artemisia cana/Agropyron smithii* (silver sagebrush/western wheat grass) habitat type.

Secondary Successional Stages

The presence or absence of a particular understory community can aid in determining degree of disturbance (present or historic) on a site. On relatively undisturbed sites, the understory under a *Populus deltoides* (plains cottonwood) community will be a diverse, dense layer of shrubs dominated by *Cornus stolonifera* (red-osier dogwood), *Amelanchier alnifolia* (Saskatoon), *Prunus virginiana* (choke cherry), and various species of *Salix* (willows) and *Ribes* (currants and gooseberries). This stage is the *Populus deltoides/Cornus stolonifera* (plains cottonwood/red-osier dogwood) community type.

With moderate levels of grazing or browsing, *Symphoricarpos occidentalis* (buckbrush) and *Rosa* species (rose) will increase, and a corresponding decrease in *Cornus stolonifera* (red-osier dogwood), *Amelanchier alnifolia* (Saskatoon), *Prunus virginiana* (choke cherry), and *Ribes* species (currants and gooseberries) will occur. If browsing pressure continues, the more desirable shrubs will be eliminated, leaving *Symphoricarpos occidentalis* (buckbrush) and *Rosa* species (rose), which can form a nearly impenetrable understory. This stage of disturbance-caused secondary succession is the *Populus deltoides/Symphoricarpos occidentalis* (plains cottonwood/buckbrush) community type. If very severe disturbance continues, ***ALL*** shrubs can be eliminated and the understory converted to herbaceous domination by species such as *Poa pratensis* (Kentucky bluegrass), *Phleum pratense* (timothy), *Bromus inermis* (awnless brome), and a variety of "weedy" forbs. This severely altered state is the *Populus deltoides*/Herbaceous (plains cottonwood/Herbaceous) community type. In this situation, the overstory of *Populus deltoides* (plains cottonwood) still matures and becomes open with an herbaceous understory. Finally the stand becomes one of widely spaced, dying cottonwoods. The site now can be so open and dry that its potential changes from trees or tall shrubs to one of the drier riparian types: the *Artemisia cana/Agropyron smithii* (silver sagebrush/western wheat grass) habitat type, the *Sarcobatus vermiculatus/Agropyron smithii* (greasewood/western wheat grass) habitat type, or the *Agropyron smithii* (western wheat grass) habitat type.

Once the stand has been converted from a shrub-dominated understory to one dominated by introduced herbaceous species, the capacity of the site to return to its former state is very limited. It may be possible, but will require drastic change in management and may be very costly. Therefore, if a manager wants to maintain the stand in a state of shrub understory domination, the most cost effective way is to change management ***BEFORE*** the site is too degraded.

SOILS

Soils are typically Regosols, usually with up to 1 m (39 in) of fine textured mineral material overlying sand or gravel. Brunisols and Chernozems can also be found on older sites of relatively longer stability where time has allowed more development to occur. Texture varies from silt loam to silty clay. Water tables drop below 1 m (39 in) of the surface in summer, but surface horizons often remain moist due to fine textures, associated low permeability, and dense shading by woody plants. As evidence of periodic saturation, redox concentrations (mottles) are common in the surface horizon and decrease with depth. These soils are generally poorly drained with high available water content.

ADJACENT COMMUNITIES

Adjacent wetter communities may be dominated by a variety of types including the *Salix exigua* (sandbar willow) community type, types dominated by *Salix lutea* (yellow willow), or the *Typha latifolia* (common cattail), *Scirpus* species (bulrush), and *Eleocharis* (spike rush) habitat types. In some situations, this type may be adjacent to open water.

Adjacent drier communities may be the *Artemisia cana/Agropyron smithii* (silver sagebrush/western wheat grass) habitat type, the *Sarcobatus vermiculatus/Agropyron smithii* (greasewood/western wheat grass) habitat type, the *Agropyron smithii* (western wheat grass) habitat type, or by a variety of upland communities.

MANAGEMENT INFORMATION

Livestock

Forage production ranges from low to moderate due to the dense nature of the stands of the *Populus deltoides/Cornus stolonifera* (plains cottonwood/red-osier dogwood) community type. Stands in good to excellent health (condition) often support dense thickets of shrubs, limiting the available forage. *Cornus stolonifera* (red-osier dogwood) is an "ice cream" plant to livestock and wildlife. Its abundance is a direct indication of past and current use levels. In some sites livestock browsing of *Cornus stolonifera* (red-osier dogwood) may be quite high.

Sites are often subjected to heavy grazing pressure because of their gentle topography and ease of access. With moderate to heavy prolonged grazing pressure, palatable shrubs will be eliminated leaving mostly *Symphoricarpos occidentalis* (buckbrush) and *Rosa* species (rose) as the dominant understory. At this stage, the stand has been converted to the *Populus deltoides/Symphoricarpos occidentalis* (plains cottonwood/buckbrush) disturbance-caused community type. If continued disturbance is severe, these shrubs also will be eliminated, and the stand converted to the *Populus deltoides/*Herbaceous (plains cottonwood/Herbaceous) disturbance-caused community type (see the discussion under the Seral Stages section).

Timber

The timber productivity of all cottonwood types is moderate to high due to favourable moisture conditions. Complete stand removal will likely result in a shrub-dominated community with extremely limited, if any, cottonwood regeneration. The occasional sprouts from stumps are unlikely to reach maturity.

Wildlife

The *Populus deltoides/Cornus stolonifera* (plains cottonwood/red-osier dogwood) community type provides valuable cover, shade, and food for a variety of species. Use by big game, such as whitetail deer and mule deer, may be high, depending upon the time of year. The spreading crown of *Populus deltoides* (plains cottonwood) provides sites for huge platform-like stick nests of bald eagles and ospreys (Arno and Hammerly 1984) and for great blue herons (Parker 1980). Canada geese occasionally use the nests previously built by bald eagles and osprey. A variety of birds and mammals, such as woodpeckers, great horned owls, wood ducks, and raccoons, nest in trunk cavities. *Populus deltoides* (plains cottonwood) and *Cornus stolonifera* (red-osier dogwood) are used by beaver for food and building materials (Allen 1983). Understory species provide food and cover for waterfowl, small birds, and mammals (Dittberner and Olson 1983).

Fisheries

The streamside location of this type is very important by providing thermal cover, debris, and streambank stability. Its importance cannot be emphasized enough (see discussion in the Soil Management and Rehabilitation Opportunities section). *Cornus stolonifera* (red-osier dogwood) and associated shrub species are excellent in controlling erosion along streams.

Fire

The *Populus deltoides/Cornus stolonifera* (plains cottonwood/red-osier dogwood) community type is susceptible to fire during late summer and fall. *Populus deltoides* (plains cottonwood) and its associated shrubs are adapted to light, and in some instances moderate intensity fires, and may produce new sprouts after a burn. The ability of cottonwoods to produce new sprouts after fire seems to depend upon three criteria:

1) In general, Populus balsamifera (balsam poplar) has a greater sprouting capability than Populus deltoides (plains cottonwood).
2) The age of the trees. As cottonwoods mature, the sprouting potential decreases. As the trees reach late maturity, sprouting potential is very limited.
3) The location of the water table. In general, the higher the water table is during the growing season, the greater the survivability of resprouts.

Therefore, if a manager wants to extend the life of a cottonwood stand, fire ***MAY BE*** used as a tool in the pole to early mature stage of development. If fire is used to rehabilitate a stand, it is imperative that the stand is excluded from all livestock grazing for at least five years and that wildlife browsing be closely monitored.

Cornus stolonifera (red-osier dogwood) and the associated shrub species can survive all but the most severe fires that remove duff and cause extended heating of the upper layer of soil. After a fire, these shrubs sprout from the surviving rhizomes or stolons (runners) (Fischer and Bradley 1987).

Soil Management and Rehabilitation Opportunities
Fine textured soils are susceptible to compaction problems. This community type is subject to recurring scouring by floods and alluvium deposition. However, stands are relatively stable because of the strong root systems of the associated species. Management should emphasize the importance of the understory shrub layer in streambank stabilization. This is very important on higher gradient streams.

Managers should maintain a buffer of *Populus deltoides* (plains cottonwood) community types adjacent to rivers and streams. These buffers provide wildlife habitat, reduce sediment loading in the stream, stabilize streambanks, and dissipate flood energy.

If the site still has a fairly high water table, a dramatic change in management (i.e. elimination of livestock grazing and close monitoring of wildlife impacts) ***MAY*** allow remnant shrubs to sprout and repopulate the stand. However, if the water table has dropped much, or if the shrubs are completely gone, the opportunity to re-establish an understory of desirable shrubs may have been lost.

Where revegetation with shrubs is the goal, some desirable species such as *Cornus stolonifera* (red-osier dogwood), *Amelanchier alnifolia* (Saskatoon), *Prunus virginiana* (choke cherry), and various species of *Salix* (willows) and *Ribes* (currants and gooseberries) may be well adapted to planting on disturbed sites. Rooted cuttings or nursery grown seedlings are easily established on moist, well-drained soils. Growth rates are rapid and the roots of established seedlings effectively stabilize recently bare soil. Remember: If the canopy cover of trees in the stand has opened up too much and/or the water table has been severely lowered, revegetation success with desirable woody species will be low.

When considering rehabilitation of stands with fire, see the discussion above in the Fire Management section about the inherent problems of fire as a tool for rehabilitation. If fire is to be used to rehabilitate a stand, it is imperative that the stand is excluded from all livestock grazing for at least five years and that browsing by wildlife be closely monitored.

The following guidelines should be followed when attempting to revegetate sites with cuttings from cottonwoods (Swenson 1988):

1) Do not plant cottonwoods on saline or alkaline sites.
2) Select sites with substrates of sand, gravel, or small cobbles. Avoid sites that are classified as clays or have a thick clay layer.
3) Make cuttings from open stands of young, rapidly growing trees. Use only cuttings that are four years old or less. Make cuttings long enough to provide 1 to 2 m (3 to 6 ft) of top length left above the soil surface (see #6 and #7 below). Remove lower branches, leaving only the tip and top two side branches.
4) Make cuttings when the plants are completely dormant.
5) Soak the cuttings in water for 10 to 14 days.

6) Auger holes to the depth of the lowest anticipated growing season water table level.
7) Place cuttings in the augered holes on the same day they are removed from the soak. Set the butt to the lowest level anticipated that the growing season groundwater would drop.
8) Back fill the holes carefully to avoid leaving air pockets.
9) Place tree guards around the cuttings if rodent or rabbit damage is likely.
10) As buds begin to swell along the cuttings, remove them from the lower two-thirds of the cutting.
11) Plantings must be protected from livestock grazing and big game browsing for two or three growing seasons. Beaver control may also be needed.

Recreational Uses and Considerations

Because of proximity to streams and flat topography, recreational developments and transportation corridors are common in this type. Opportunities are excellent in this type for fishing, big game, and waterfowl hunting, and observing a variety of bird species.

Care must be taken when locating structures in this type. Some campgrounds have been seriously damaged by floods or lost altogether.

OTHER STUDIES

The *Populus deltoides/Cornus stolonifera* (plains cottonwood/red-osier dogwood) community type is described by Hansen and others (1995) for the Great Plains part of Montana. Similar communities have been described by Nelson (1961), Jorgensen (1979), Boggs (1984), and Hansen and others (1984).

Populus deltoides/Herbaceous Community Type
(Plains Cottonwood/Herbaceous Community Type)

POPUDEL
Number of Stands Sampled = 12
Number of Stands Sampled in Saskatchewan = 2

LOCATION AND ASSOCIATED LANDFORMS

The *Populus deltoides*/Herbaceous (plains cottonwood/Herbaceous) community type is a minor type at low elevations in the southern part of the Grassland Ecoregions in Saskatchewan. The type occurs on older alluvial bars of major streams and rivers, and around lakes and ponds. *Populus deltoides* (plains cottonwood) is found at the lowest elevation of the three cottonwood species occurring in Saskatchewan. Stands may be extensive on major river floodplain terraces, such as along the South Saskatchewan River.

VEGETATION

The *Populus deltoides*/Herbaceous (plains cottonwood/Herbaceous) community type is a grazing or browsing disclimax community type characterized by two structural layers: a mature, widely spaced *Populus deltoides* (plains cottonwood) over an herbaceous understory dominated by *Bromus inermis* (awnless brome), *Agropyron repens* (quack grass), *Elymus canadensis* (Canada wild rye), *Solidago canadensis* (Canada goldenrod), and *Glycyrrhiza lepidota* (wild licorice). Shrub species are absent or present only as remnant, scattered individuals (Table 13).

Table 13. Average canopy cover, range of canopy cover, and constancy for plant species recorded in 12 sampled stands of the grazing or browsing disclimax *Populus deltoides*/Herbaceous (plains cottonwood/Herbaceous) community type

TABLE 13.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Trees			
Fraxinus pennsylvanica (green ash)	1	0-1	17
Populus deltoides (plains cottonwood)	65	40-98	100
Shrubs			
Amelanchier alnifolia (Saskatoon)	1	0-1	17
Artemisia cana (silver sagebrush)	3	0-3	8
Clematis ligusticifolia (western clematis)	1	0-1	8
Cornus stolonifera (red-osier dogwood)	1	0-1	25
Elaeagnus angustifolia (Russian olive)	1	0-1	17
Parthenocissus quinquefolia (Virginia creeper)	2	0-3	17
Prunus virginiana (choke cherry)	1	0-1	8
Rhus radicans (poison ivy)	1	0-3	25
Rhus trilobata (skunkbush)	1	0-1	8
Ribes aureum (golden currant)	1	0-1	8
Rosa woodsii (common wild rose)	1	0-1	25
Rosa spp. (rose)	1	0-1	17
Salix amygdaloides (peach-leaved willow)	1	0-1	42
Salix exigua (sandbar willow)	5	0-10	17
Salix lutea (yellow willow)	2	0-3	17
Shepherdia argentea (thorny buffaloberry)	1	0-3	33
Symphoricarpos occidentalis (buckbrush)	3	0-10	58
Vitis riparia (riverbank grape)	1	0-1	17
Graminoids			
Agropyron repens (quack grass)	10	0-20	58
Agropyron smithii (western wheat grass)	18	0-30	25
Agrostis stolonifera (redtop)	2	0-3	17
Agropyron trachycaulum (slender wheat grass)	40	0-40	8
Bromus inermis (awnless brome)	27	0-70	50
Bromus japonicus (Japanese chess)	1	0-1	8
Calamovilfa longifolia (sand grass)	3	0-3	25
Carex atherodes (awned sedge)	1	0-1	8
Elymus canadensis (Canada wild rye)	12	0-20	58
Hordeum jubatum (foxtail barley)	2	0-3	17
Muhlenbergia racemosa (marsh muhly)	16	0-20	33
Phalaris arundinacea (reed canary grass)	3	0-3	8
Poa palustris (fowl bluegrass)	12	0-20	17
Poa pratensis (Kentucky bluegrass)	20	0-20	17
Poa spp. (bluegrass)	3	0-3	8
Spartina pectinata (prairie cord grass)	10	0-10	8
Forbs			
Ambrosia psilostachya (perennial ragweed)	3	0-3	8
Apocynum cannabinum (Indian hemp)	8	0-10	25
Artemisia absinthium (absinthe wormwood)	7	0-10	17
Artemisia ludoviciana (prairie sagewort)	1	0-1	25
Asclepias speciosa (showy milkweed)	1	0-1	8
Asclepias verticillata (whorled milkweed)	1	0-1	8
Aster ericoides (tufted white prairie aster)	1	0-1	8
Aster spp. (aster)	2	0-3	17
Cirsium arvense (Canada thistle)	1	0-1	25
Euphorbia esula (leafy spurge)	1	0-1	8
Glycyrrhiza lepidota (wild licorice)	5	0-20	83
Grindelia squarrosa (gumweed)	1	0-1	25
Helenium autumnale (sneezeweed)	1	0-1	8
Helianthus nuttallii (common tall sunflower)	3	0-3	8
Melilotus alba (white sweet-clover)	6	0-20	33
Melilotus officinalis (yellow sweet-clover)	1	0-1	17
Petalostemon spp. (prairie-clover)	1	0-1	8
Potentilla anserina (silverweed)	1	0-1	8
Rumex triangulivalvis (narrow-leaved dock)	1	0-1	8
Smilacina stellata (star-flowered Solomon's-seal)	3	0-3	8
Solidago canadensis (Canada goldenrod)	9	0-20	33
Solidago gigantea (late goldenrod)	7	0-10	17
Taraxacum officinale (common dandelion)	1	0-1	8

TABLE 13.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Thermopsis rhombifolia (golden bean)	7	0-10	17
Vicia americana (wild vetch)	1	0-3	25
Xanthium strumarium (cocklebur)	3	0-3	8
Ferns and Allies			
Equisetum arvense (common horsetail)	8	0-20	25

SUCCESSIONAL INFORMATION

The *Populus deltoides*/Herbaceous (plains cottonwood/Herbaceous) community type represents a severely disturbed secondary successional stage of the mid-seral *Populus deltoides/Cornus stolonifera* (plains cottonwood/red-osier dogwood) community type.

Primary Successional Stages

Cottonwoods are a pioneering species that for establishment require moist, barren, newly deposited alluvium that is exposed to full sunlight. In general, these sites represent point bars, sidebars, mid channel bars, delta bars, and islands along major streams. Since cottonwoods are a pioneering species, and do not regenerate in their own shade, they are considered a seral species and do not represent the climax vegetation or potential for the site. Many stands may appear to have some limited regeneration, especially in open areas. However, it is important to understand that these young plants represent root sprouts (asexual reproduction), not establishment by seeds (sexual reproduction). These sprouts may prolong the life of the stand, but will not perpetuate it. If the site is left undisturbed, in time the cottonwoods will be replaced by a later successional stage.

Erosion and deposition along a river help maintain plant community diversity on its floodplain. Distribution of the various plant communities depends on the river dynamics. Channel migration rate determines the proportion of floodplain communities in early seral, mid seral, late seral, or climax (PNC) successional stage. If the migration rate is high, few stands progress to late successional stage. Near the outer edges of the floodplain, effect of the river is reduced, allowing more late stages to develop. Lateral movement of the river initiates a dynamic series of vegetation events. The stream erodes its banks on outside curves, typically covered with riparian vegetation in later successional stages. The stream then deposits fresh alluvium on point bars along inside curves. Each new alluvial deposit adds to or forms a distinct band or terrace supporting a vegetation community of a different age. The bands generally are progressively older as one moves away from the channel and onto higher terraces. Parts of the floodplain may remain undisturbed long enough for their elevation to increase enough with respect to the channel that they are rarely, if ever, flooded. These are considered old, mature alluvial terraces, and they may continue development toward climax (PNC) without the modifying influences of floods (Hansen 1989).

Early Seral Stage—The *Populus deltoides*/Recent Alluvial Bar (plains cottonwood/Recent Alluvial Bar) community type is the initial seral stage of this type.

Mid-Seral Stage—If disturbance (human-caused or natural) does not alter or eliminate the stand, the *Populus deltoides*/Recent Alluvial Bar (plains cottonwood/Recent Alluvial Bar) community type will progress to the mid-seral stage *Populus deltoides/Cornus stolonifera* (plains cottonwood/red-osier dogwood) community type. The understory of pole to mature *Populus deltoides* (plains cottonwood) may be dominated by young *Acer negundo* (Manitoba maple), or in some cases, *Fraxinus pennsylvanica* (green ash) trees.

Late Seral to Climax (PNC) Stage—As the cottonwood stand dies, primary succession toward later seral communities will occur unless a flood deposits new sediment suitable for cottonwood seedlings. In the absence of this event, succession continues from the *Populus deltoides/Cornus stolonifera* (plains cottonwood/red-osier dogwood) community type toward some habitat type (potential vegetation of the site). If the cottonwood understory has *Acer negundo* (Manitoba maple) or *Fraxinus pennsylvanica* (green ash) present as the *Populus deltoides* (plains cottonwood) overstory matures, becomes open, and then decadent, the *Acer negundo* (Manitoba maple) or *Fraxinus pennsylvanica* (green ash) will replace the cottonwoods. The stand then goes to the *Acer negundo/Prunus virginiana* (Manitoba maple/choke cherry) or the *Fraxinus pennsylvanica/Prunus virginiana* (green ash/choke cherry) habitat type. In many cases when no climax tree species are present, the cottonwood mid seral stage will progress to a shrub habitat type, such as the *Salix lutea/ Cornus stolonifera* (yellow willow/red-osier dogwood) habitat type or the *Artemisia cana/Agropyron smithii* (silver sagebrush/western wheat grass) habitat type.

Secondary Successional Stages

The presence or absence of a particular understory community can aid in determining degree of disturbance (present or historic) on a site. On relatively undisturbed sites, the understory under a *Populus deltoides* (plains cottonwood) community will be a diverse, dense layer of shrubs dominated by *Cornus stolonifera* (red-osier dogwood), *Amelanchier alnifolia* (Saskatoon), *Prunus virginiana* (choke cherry), and various species of *Salix* (willows) and *Ribes* (currants and gooseberries). This stage is called the *Populus deltoides/Cornus stolonifera* (plains cottonwood/red-osier dogwood) community type.

With moderate levels of grazing or browsing, *Symphoricarpos occidentalis* (buckbrush) and *Rosa* species (rose) will increase, and a corresponding decrease in *Cornus stolonifera* (red-osier dogwood), *Amelanchier alnifolia* (Saskatoon), *Prunus virginiana* (choke cherry), and *Ribes* species (currants and gooseberries) will occur. If browsing pressure continues, the more desirable shrubs will be eliminated, leaving *Symphoricarpos occidentalis* (buckbrush) and *Rosa* species (rose), which can form a nearly impenetrable understory. This stage of disturbance-caused secondary succession is the *Populus deltoides/Symphoricarpos occidentalis* (plains cottonwood/buckbrush) community type. If very severe disturbance continues, ***ALL*** shrubs can be eliminated and the understory converted to herbaceous domination by species such as *Poa pratensis* (Kentucky bluegrass), *Phleum pratense* (timothy), *Bromus inermis* (awnless brome), and a variety of "weedy" forbs. This severely altered state is the *Populus deltoides*/Herbaceous (plains cottonwood/Herbaceous) community type. In this situation, the overstory of *Populus deltoides* (plains cottonwood) still matures and becomes open with an herbaceous understory. Finally the stand becomes one of widely spaced, dying cottonwoods. The site now can be so open and dry that its potential changes from trees or tall shrubs to one of the drier riparian types: the *Artemisia cana/Agropyron smithii* (silver sagebrush/western wheat grass) habitat type, the *Sarcobatus vermiculatus/Agropyron smithii* (greasewood/western wheat grass) habitat type, or the *Agropyron smithii* (western wheat grass) habitat type.

Once the stand has been converted from a shrub-dominated understory to one dominated by introduced herbaceous species, the capacity of the site to return to its former state is very limited. It may be possible, but will require drastic change in management and may be very costly. Therefore, if a manager wants to maintain the stand in a state of shrub understory domination, the most cost effective way is to change management ***BEFORE*** the site is too degraded.

SOILS

Soils are typically Regosols, usually with up to 1 m (39 in) of fine textured mineral material overlying sand or gravel. Brunisols and Chernozems can also be found on older sites of relatively longer stability where time has allowed more development to occur. Texture varies from silt loam to silty clay. Water tables drop below 1 m (39 in) of the surface in summer. Redox concentrations (mottles) are rare in these soils. Soils are generally poorly drained with high available water early in the growing season, but usually dry out quickly due to the lack of shading by shrub species.

ADJACENT COMMUNITIES

Adjacent wetter communities may be dominated by a variety of types including the *Salix exigua* (sandbar willow) community type, types dominated by *Salix lutea* (yellow willow), or the *Typha latifolia* (common cattail), *Scirpus* species (bulrush), and *Eleocharis* (spike rush) habitat types. In some situations, this type may be adjacent to open water.

Adjacent drier communities may be the *Artemisia cana/Agropyron smithii* (silver sagebrush/western wheat grass) habitat type, the *Sarcobatus vermiculatus/Agropyron smithii* (greasewood/western wheat grass) habitat type, the *Agropyron smithii* (western wheat grass) habitat type, or by a variety of upland communities.

MANAGEMENT INFORMATION

Livestock

The *Populus deltoides*/Herbaceous (plains cottonwood/Herbaceous) community type provides moderate levels of spring and summer forage. Heavy grazing and trampling tend to maintain the open (park-like) structure of this community type and maintains dominance by the grasses and "weedy" forbs. The ranchers often use this community type as a winter feeding ground. *Poa pratensis* (Kentucky bluegrass), *Phleum pratense* (timothy), and *Bromus inermis* (awnless brome) are palatable and moderately productive grasses, especially when soil moisture is high, and they tolerate a high degree of defoliation. *Poa pratensis* (Kentucky bluegrass) is well adapted to grazing and is considered an increaser and an invader, especially if grazing intensities and durations are severe (Wasser 1982). This species can produce new shoots from existing tillers or rhizomes. Grazing practices influence the growth form of *Poa pratensis* (Kentucky bluegrass) (Volland 1978). A high density of weak, low vigour tillers results from season long grazing. Stem densities are emphasized over aboveground biomass. Early season rest increases the vigour of individual plants. Fewer shoots may be produced, but total aboveground biomass tends to be greater.

Timber

The timber productivity of all cottonwood types is moderate to high due to favourable moisture conditions. Complete stand removal will likely result in a shrub-dominated community with extremely limited, if any, cottonwood regeneration. The occasional sprouts from stumps are unlikely to reach maturity.

Wildlife

This type is a source of early spring forage for deer and elk. Cover value is limited because of the open structure. Many kinds of birds are common since food and cover is available both on the ground and in the trees. Great blue herons nest in large cottonwood stands if isolation during the nesting period is possible. Colonial nest sites are used for many years if left undisturbed (Parker 1980). Osprey will also use this type for nesting (Zarn 1974).

Fisheries

The streamside location of this type is important in providing thermal cover, debris, and streambank stability.

Its importance cannot be emphasized enough (see discussion in the Soil Management and Rehabilitation Opportunities section).

Fire

This type will burn when conditions are dry, such as fall or in late winter if snow accumulations are minimal. The ability of cottonwoods to produce new sprouts after fire seems to depend upon three criteria:

1) In general, *Populus balsamifera* (balsam poplar) has a greater sprouting capability than *Populus deltoides* (plains cottonwood).
2) The age of the trees. As cottonwoods mature, the sprouting potential decreases. As the trees reach late maturity, sprouting potential is very limited.
3) The location of the water table. In general, the higher the water table is during the growing season, the greater the survivability of resprouts.

Therefore, if a manager wants to extend the life of a cottonwood stand, fire ***MAY BE*** used as a tool in the pole to early mature stage of development. If fire is used to rehabilitate a stand, it is imperative that the stand is excluded from all livestock grazing for at least five years and that wildlife browsing be closely monitored.

Cornus stolonifera (red-osier dogwood) and the associated shrub species can survive all but the most severe fires that remove duff and cause extended heating of the upper layer of soil. After a fire, these shrubs sprout from the surviving rhizomes or stolons (runners) (Fischer and Bradley 1987).

Soil Management and Rehabilitation Opportunities

Fine textured soils are susceptible to compaction problems. This community type is subject to recurring scouring by floods and alluvium deposition. These stands are relatively less stable because of the removal of the strong root systems of shrub species. Management should emphasize the importance of understory shrubs in streambank stabilization.

Managers should maintain a buffer of *Populus deltoides* (plains cottonwood) community types adjacent to rivers and streams. These buffers provide wildlife habitat, reduce sediment loading in the stream, stabilize streambanks, and dissipate flood energy.

If the site still has a fairly high water table, a dramatic change in management (i.e. elimination of livestock grazing and close monitoring of wildlife impacts) ***MAY*** allow remnant shrubs to sprout and repopulate the stand. However, if the water table has dropped much, or if the shrubs are completely gone, the opportunity to re-establish an understory of desirable shrubs may have been lost.

Where revegetation with shrubs is the goal, some desirable species such as *Cornus stolonifera* (red-osier dogwood), *Amelanchier alnifolia* (Saskatoon), *Prunus virginiana* (choke cherry), and various species of *Salix* (willows) and *Ribes* (currants and gooseberries) may be well adapted to planting on disturbed sites. Rooted cuttings or nursery grown seedlings are easily established on moist, well-drained soils. Growth rates are rapid and the roots of established seedlings effectively stabilize recently bare soil. Remember: If the canopy cover of trees in the stand has opened up too much and/or the water table has been severely lowered, revegetation success with desirable woody species will be low.

When considering rehabilitation of stands with fire, see the discussion above in the Fire Management section about the inherent problems of fire as a tool for rehabilitation. If fire is to be used to rehabilitate a stand, it is imperative that the stand is excluded from all livestock grazing for at least five years and that browsing by wildlife be closely monitored.

The following guidelines should be followed when attempting to revegetate sites with cuttings from cottonwoods (Swenson 1988):

1) Do not plant cottonwoods on saline or alkaline sites.
2) Select sites with substrates of sand, gravel, or small cobbles. Avoid sites that are classified as clays or have a thick clay layer.
3) Make cuttings from open stands of young, rapidly growing trees. Use only cuttings that are four years old or less. Make cuttings long enough to provide 1 to 2 m (3 to 6 ft) of top length left above the soil surface (see #6 and #7 below). Remove lower branches, leaving only the tip and top two side branches.
4) Make cuttings when the plants are completely dormant.
5) Soak the cuttings in water for 10 to 14 days.
6) Auger holes to the depth of the lowest anticipated growing season water table level.
7) Place cuttings in the augered holes on the same day they are removed from the soak. Set the butt to the lowest level anticipated that the growing season groundwater would drop.
8) Back fill the holes carefully to avoid leaving air pockets.
9) Place tree guards around the cuttings if rodent or rabbit damage is likely.
10) As buds begin to swell along the cuttings, remove them from the lower two-thirds of the cutting.
11) Plantings must be protected from livestock grazing and big game browsing for two or three growing seasons. Beaver control may also be needed.

Recreational Uses and Considerations

Because of proximity to streams and flat topography, recreational developments and transportation corridors are common in this type. Opportunities are excellent in this type for fishing, big game, and waterfowl hunting, and observing a variety of bird species. Care must be taken when locating structures in this type. Some campgrounds have been seriously damaged by floods or lost altogether.

OTHER STUDIES

Hansen and others (1995) described the *Populus deltoides*/Herbaceous (plains cottonwood/Herbaceous) community type for the Northern Great Plains of Montana. Similar communities have been described by Nelson (1961), Jorgensen (1979), Boggs (1984), and Hansen and others (1984).

Populus deltoides/Recent Alluvial Bar Community Type

(Plains Cottonwood/Recent Alluvial Bar Community Type)

POPUDEL

Number of Stands Sampled = 34

Number of Stands Sampled in Saskatchewan = 1

LOCATION AND ASSOCIATED LANDFORMS

The *Populus deltoides*/Recent Alluvial Bar (plains cottonwood/Recent Alluvial Bar) community type is a minor type at low elevations in the southern part of the Grassland Ecoregions in Saskatchewan. The type occurs on recent alluvial bars of major streams and rivers, and around lakes and ponds. *Populus deltoides* (plains cottonwood) is found at the lowest elevation of the three cottonwood species occurring in Saskatchewan. Stands may be extensive on major river floodplain terraces, such as along the South Saskatchewan River.

VEGETATION

This type is characterized by a stand dominated by seedlings or saplings of *Populus deltoides* (plains cottonwood), or a stand codominated by cottonwoods and

Salix exigua (sandbar willow). *Populus balsamifera* (balsam poplar) may be present but is subordinate to *Populus deltoides* (plains cottonwood). The herbaceous understory contains a diverse group of plants (Table 14).

Table 14. Average canopy cover, range of canopy cover, and constancy for species recorded in 16 stands of the *Populus deltoides*/Recent Alluvial Bar (plains cottonwood/Recent Alluvial Bar) community type that are relatively undisturbed by livestock or wildlife

TABLE 14.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Trees			
Fraxinus pennsylvanica (green ash)	1	0-1	6
Populus angustifolia (narrow-leaf cottonwood)	30	0-30	6
Populus deltoides (plains cottonwood)	31	3-60	100
Shrubs			
Cornus stolonifera (red-osier dogwood)	1	0-1	6
Rhus radicans (poison ivy)	1	0-1	6
Ribes aureum (golden currant)	1	0-1	6
Rosa spp. (rose)	3	0-3	13
Salix amygdaloides (peach-leaved willow)	7	0-40	50
Salix exigua (sandbar willow)	14	0-60	94
Salix lutea (yellow willow)	5	0-10	19
Graminoids			
Agropyron repens (quack grass)	3	0-3	13
Agropyron smithii (western wheat grass)	70	0-70	6
Agrostis stolonifera (redtop)	10	0-10	6
Agropyron trachycaulum (slender wheat grass)	10	0-10	6
Bromus inermis (awnless brome)	1	0-1	6
Calamovilfa longifolia (sand grass)	3	0-3	6
Carex lanuginosa (woolly sedge)	1	0-1	6
Distichlis stricta (salt grass)	1	0-1	6
Echinochloa crusgalli (barnyard grass)	6	0-20	25
Eleocharis palustris (creeping spike-rush)	2	0-3	13
Elymus canadensis (Canada wild rye)	5	0-20	31
Hordeum jubatum (foxtail barley)	1	0-3	19
Muhlenbergia racemosa (marsh muhly)	20	0-20	6
Panicum capillare (witch grass)	1	0-1	6
Phalaris arundinacea (reed canary grass)	50	0-50	6
Poa pratensis (Kentucky bluegrass)	1	0-1	6
Polypogon monspeliensis (rabbitfoot grass)	1	0-1	6
Scirpus pungens (three-square rush)	60	0-60	6
Setaria viridis (green foxtail)	1	0-1	6
Spartina pectinata (prairie cord grass)	3	0-3	6
Sporobolus cryptandrus (sand dropseed)	20	0-20	6
Forbs			
Apocynum cannabinum (Indian hemp)	1	0-1	6
Artemisia absinthium (absinthe wormwood)	1	0-1	6
Asclepias verticillata (whorled milkweed)	3	0-3	6
Aster ericoides (tufted white prairie aster)	2	0-3	13
Chenopodium album (lamb's-quarters)	1	0-1	13
Cirsium arvense (Canada thistle)	5	0-10	13
Coreopsis tinctoria (common tickseed)	1	0-1	6
Euphorbia esula (leafy spurge)	1	0-1	6
Euphorbia glyptosperma (ridge-seeded spurge)	1	0-1	6
Glycyrrhiza lepidota (wild licorice)	2	0-10	31
Gnaphalium palustre (marsh cudweed)	1	0-1	6
Gutierrezia sarothrae (broomweed)	1	0-1	6
Helenium autumnale (sneezeweed)	1	0-1	6
Helianthus couplandii (Coupland's annual sunflower)	3	0-3	6
Melilotus alba (white sweet-clover)	1	0-3	19
Melilotus officinalis (yellow sweet-clover)	3	0-3	6
Mentha arvensis (wild mint)	1	0-1	6
Plantago major (common plantain)	1	0-1	13
Plantago patagonica (Pursh's plantain)	1	0-1	6
Polygonum amphibium (water smartweed)	3	0-3	31

TABLE 14.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Polygonum monspeliense (knotweed)	10	0-20	13
Potentilla gracilis (graceful cinquefoil)	30	0-30	6
Potentilla paradoxa (bushy cinquefoil)	1	0-1	13
Rumex crispus (curled dock)	2	0-3	13
Rumex maritimus (golden dock)	2	0-3	19
Rumex triangulivalvis (narrow-leaved dock)	1	0-1	13
Solidago canadensis (Canada goldenrod)	3	0-3	6
Sonchus asper (prickly annual sow-thistle)	1	0-1	13
Sonchus spp. (sow-thistle)	1	0-1	6
Taraxacum officinale (common dandelion)	1	0-1	13
Vicia americana (wild vetch)	1	0-1	6
Xanthium strumarium (cocklebur)	27	0-50	13
Ferns and Allies			
Equisetum arvense (common horsetail)	10	0-20	13

SUCCESSIONAL INFORMATION

The *Populus deltoides*/Recent Alluvial Bar (plains cottonwood/Recent Alluvial Bar) community type represents an early seral (pioneer) stage of primary succession.

Primary Successional Stages

Cottonwoods are a pioneering species that for establishment require moist, barren, newly deposited alluvium that is exposed to full sunlight. In general, these sites represent point bars, side bars, mid channel bars, delta bars, and islands along major streams. Since cottonwoods are a pioneering species, and do not regenerate in their own shade, they are considered a seral species and do not represent the climax vegetation or potential for the site. Many stands may appear to have some limited regeneration, especially in open areas. However, it is important to understand that these young plants represent root sprouts (asexual reproduction), not establishment by seeds (sexual reproduction). These sprouts may prolong the life of the stand, but will not perpetuate it. If the site is left undisturbed, in time the cottonwoods will be replaced by a later successional stage.

Erosion and deposition along a river help maintain plant community diversity on its floodplain. Distribution of the various plant communities depends on the river dynamics. Channel migration rate determines the proportion of floodplain communities in early seral, mid seral, late seral, or climax (PNC) successional stage. If the migration rate is high, few stands progress to late successional stage. Near the outer edges of the floodplain, effect of the river is reduced, allowing more late stages to develop. Lateral movement of the river initiates a dynamic series of vegetation events. The stream erodes its banks on outside curves, typically covered with riparian vegetation in later successional stages. The stream then deposits fresh alluvium on point bars along inside curves. Each new alluvial deposit adds to or forms a distinct band or terrace supporting a vegetation community of a different age. The bands generally are progressively older as one moves away from the channel and onto higher terraces. Parts of the floodplain may remain undisturbed long enough for their elevation to increase enough with respect to the channel that they are rarely, if ever, flooded. These are considered old, mature alluvial terraces, and they may continue development toward climax (PNC) without the modifying influences of floods (Hansen 1989).

Early Seral Stage—The *Populus deltoides*/Recent Alluvial Bar (plains cottonwood/Recent Alluvial Bar) community type is the initial seral stage of this type.

Mid-Seral Stage—If disturbance (human-caused or natural) does not alter or eliminate the stand, the *Populus deltoides*/Recent Alluvial Bar (plains cottonwood/Recent Alluvial Bar) community type will progress to the mid-seral stage *Populus deltoides/Cornus stolonifera* (plains cottonwood/red-osier dogwood) community type. The understory of pole to mature *Populus deltoides* (plains cottonwood) may be dominated by young *Acer negundo* (Manitoba maple), or in some cases *Fraxinus pennsylvanica* (green ash) trees.

Late Seral to Climax (PNC) Stage—As the cottonwood stand dies, primary succession toward later seral communities will occur unless a flood deposits new sediment suitable for cottonwood seedlings. In the absence of this event, succession continues from the *Populus deltoides/Cornus stolonifera* (plains cottonwood/red-osier dogwood) community type toward some habitat type (potential vegetation of the site). If the cottonwood understory has *Acer negundo* (Manitoba maple) or *Fraxinus pennsylvanica* (green ash) present as the *Populus deltoides* (plains cottonwood) overstory matures, becomes open, and then decadent, the *Acer negundo* (Manitoba maple) or *Fraxinus pennsylvanica* (green ash) will replace the cottonwoods. The stand then goes to the *Acer negundo/Prunus virginiana* (Manitoba maple/choke cherry) or the *Fraxinus pennsylvanica/Prunus virginiana* (green ash/choke cherry) habitat type. In many cases when no climax tree species are present, the cottonwood mid seral stage will progress to a shrub habitat type, such as the *Salix lutea/ Cornus stolonifera* (yellow willow/red-osier dogwood) habitat type or the *Artemisia cana/Agropyron smithii* (silver sagebrush/western wheat grass) habitat type.

Secondary Successional Stages

The normal primary successional sequence (described above) may be altered due to varying degrees of grazing and browsing pressure. Moderate, prolonged grazing and browsing will shift to the disturbance-caused *Populus deltoides/Symphoricarpos occidentalis* (plains cottonwood/buckbrush) community type. Severe, prolonged grazing and browsing pressure may eliminate all deciduous tree seedlings and may eliminate the undergrowth of shrub species. This severely disturbed stage of secondary succession is called the *Populus deltoides*/Herbaceous (plains cottonwood/herbaceous) community type. In this situation, the overstory of *Populus deltoides* (plains cottonwood) still matures and becomes open, now with an understory dominated by herbaceous species. Finally the stand becomes decadent with widely spaced, dying cottonwoods. The site is so open and dry that the potential may have changed to one of a variety of upland types.

Stands of the *Populus deltoides/Symphoricarpos occidentalis* (plains cottonwood/buckbrush) community type are very susceptible to natural dynamics of the river, and may be drowned or swept away after just a year or two of growth. Ice can have a great impact on these recently deposited bars. Ice can influence the floodplain by either of two ways: 1) mechanical damage, or 2) flooding (inundation). Mechanical damage can mean any of the following: a) the laying down or bending over of the young trees, b) shearing off of the stems, c) pulling roots from the ground by movement of ice frozen around the stems, and d) tilting or pushing over of mature trees.

Cottonwood seedlings and saplings are very susceptible to defoliation by livestock. If livestock pressure is too great, the stand can be partially or totally eliminated. In many situations, livestock utilization has eliminated stands of newly established cottonwood seedlings. Beaver and wild ungulates can also have a severe impact on young cottonwood stands.

SOILS

Soils are typically Regosols, are deep and formed in recent alluvium. Surface horizons are typically fine textured (silty clay to clay), overlying a stratified, coarse textured substratum of some sand or gravels. The water table is generally at or near the soil surface, although in late summer it may drop below 50 cm (20 in) of the soil surface. Surface horizons generally remain moist due to capillary action. Soils are poorly drained, permeability is slow, and available water is high.

ADJACENT COMMUNITIES

Adjacent wetter communities may be dominated by a variety of types including the *Salix exigua* (sandbar willow) community type, types dominated by *Salix lutea* (yellow willow), or the *Typha latifolia* (common cattail), *Scirpus* species (bulrush), and *Eleocharis* species (spike rush) habitat types. In some situations, this type may be adjacent to open water.

Adjacent drier communities may be the *Artemisia cana/Agropyron smithii* (silver sagebrush/western wheat grass) habitat type, the *Sarcobatus vermiculatus/Agropyron smithii* (greasewood/western wheat grass) habitat type, the *Agropyron smithii* (western wheat grass) habitat type, or by a variety of upland communities.

MANAGEMENT INFORMATION

Livestock

Forage production is low to moderate. Stands in good to excellent health (condition) often support dense thickets of cottonwoods and associated shrub species thereby limiting the amount of available forage. These stands are very susceptible to defoliation by livestock. If establishment of new cottonwood stands is a management objective, livestock impacts should be closely monitored. In some situations, it may be advisable to eliminate grazing use until the cottonwoods have grown beyond reach of the livestock.

Wildlife

The *Populus deltoides*/Recent Alluvial Bar (plains cottonwood/Recent Alluvial Bar) community type provides valuable cover, shade, and food for a variety of species. Big game use may be high, depending upon the time of year. *Populus deltoides* (plains cottonwood) is used by beaver for food and building materials (Allen 1983). Understory species provide food and cover for waterfowl, small birds, and mammals (Dittberner and Olson 1983).

Fisheries

The streamside location of this type is important in providing future thermal cover, debris, and streambank stability. Its importance cannot be emphasized enough (see discussion in the Soil Management and Rehabilitation Opportunities section).

Fire

The *Populus deltoides*/Recent Alluvial Bar (plains cottonwood/Recent Alluvial Bar) community type is susceptible to fire. In general, cottonwood seedlings, and to a lesser degree, cottonwood saplings do not have an extensive root system or thick bark, and they may be killed by fire.

Soil Management and Rehabilitation Opportunities

Fine textured soils are susceptible to compaction problems. This community type is subject to recurring scouring by floods and alluvium deposition. However, stands are relatively stable because of the strong root systems of the associated species. Management should emphasize the importance of the understory shrub layer in streambank stabilization. This is very important on higher gradient streams.

Managers should maintain a buffer of *Populus deltoides* (plains cottonwood) community types adjacent to rivers and streams. These buffers provide wildlife habitat, reduce sediment loading in the stream, stabilize streambanks, and dissipate flood energy.

If the site still has a fairly high water table, a dramatic change in management (i.e. elimination of livestock grazing and close monitoring of wildlife impacts) ***MAY*** allow remnant shrubs to sprout and repopulate the stand. However, if the water table has dropped much, or if the shrubs are completely gone, the opportunity to re-establish an understory of desirable shrubs may have been lost.

Where revegetation with shrubs is the goal, some desirable species such as *Cornus stolonifera* (red-osier dogwood), *Amelanchier alnifolia* (Saskatoon), *Prunus virginiana* (choke cherry), and various species of *Salix* (willows) and *Ribes* (currants and gooseberries) may be well adapted to planting on disturbed sites. Rooted cuttings or nursery grown seedlings are easily established on moist, well-drained soils. Growth rates are rapid and the roots of established seedlings effectively stabilize recently bare soil. Remember: If the canopy cover of trees in the stand has opened up too much and/or the water table has been severely lowered, revegetation success with desirable woody species will be low.

When considering rehabilitation of stands with fire, see the discussion above in the Fire Management section about the inherent problems of fire as a tool for rehabilitation. If fire is to be used to rehabilitate a stand, it is imperative that the stand is excluded from all livestock grazing for at least five years and that browsing by wildlife be closely monitored.

The following guidelines should be followed when attempting to revegetate sites with cuttings from cottonwoods (Swenson 1988):

1) Do not plant cottonwoods on saline or alkaline sites.
2) Select sites with substrates of sand, gravel, or small cobbles. Avoid sites that are classified as clays or have a thick clay layer.
3) Make cuttings from open stands of young, rapidly growing trees. Use only cuttings that are four years old or less. Make cuttings long enough to provide 1 to 2 m (3 to 6 ft) of top length left above the soil surface (see #6 and #7 below). Remove lower branches, leaving only the tip and top two side branches.
4) Make cuttings when the plants are completely dormant.
5) Soak the cuttings in water for 10 to 14 days.
6) Auger holes to the depth of the lowest anticipated growing season water table level.
7) Place cuttings in the augered holes on the same day they are removed from the soak. Set the butt to the lowest level anticipated that the growing season groundwater would drop.
8) Back fill the holes carefully to avoid leaving air pockets.
9) Place tree guards around the cuttings if rodent or rabbit damage is likely.
10) As buds begin to swell along the cuttings, remove them from the lower two-thirds of the cutting.
11) Plantings must be protected from livestock grazing and big game browsing for two or three growing seasons. Beaver control may also be needed.

Recreational Uses and Considerations

Because of proximity to streams and flat topography, recreational developments and transportation corridors are common in this type. Opportunities are excellent in this type for fishing, big game, and waterfowl hunting, and observing a variety of bird species.

OTHER STUDIES

A *Populus deltoides*/Recent Alluvial Bar (plains cottonwood/Recent Alluvial Bar) community type is described by Hansen and others (1995) for the Great Plains portion of Montana.

Populus deltoides/Symphoricarpos occidentalis Community Type (Plains Cottonwood/Buckbrush Community Type)

POPUDEL/SYMPOCC

Number of Stands Sampled = 25

Number of Stands Sampled in Saskatchewan = 0

LOCATION AND ASSOCIATED LANDFORMS

The *Populus deltoides/Symphoricarpos occidentalis* (plains cottonwood/buckbrush) community type is a minor type at low elevations in the southern part of the Grassland Ecoregions in Saskatchewan. The type occurs on older alluvial bars of major streams and rivers, and around lakes and ponds. *Populus deltoides* (plains cottonwood) is found at the lowest elevation of the two cottonwood species occurring in Saskatchewan. Stands may be extensive on major river floodplain terraces, such as along the South Saskatchewan River.

VEGETATION

The *Populus deltoides/Symphoricarpos occidentalis* (plains cottonwood/buckbrush) community type represents a grazing disclimax, where the more palatable shrubs, such as *Salix* (willows) and *Cornus stolonifera* (red-osier dogwood), have been eliminated from the site. It is characterized by an overstory of *Populus deltoides* (plains cottonwood) over an understory dominated by *Symphoricarpos occidentalis* (buckbrush) or *Rosa* species (rose) (Table 15).

Table 15. Average canopy cover, range of canopy cover, and constancy for those species recorded in 25 sampled stands of the grazing disclimax *Populus deltoides/Symphoricarpos occidentalis* (plains cottonwood/buckbrush) community type

TABLE 15.	**% Can. Cov.**		
Species	**Avg.**	**Rng.**	**Con.**
Trees			
Acer negundo (Manitoba maple)	1	0-1	4
Fraxinus pennsylvanica (green ash)	1	0-1	24
Populus angustifolia (narrow-leaf cottonwood)	20	0-20	4
Populus balsamifera (balsam poplar)	20	0-20	8
Populus deltoides (plains cottonwood)	51	20-90	100
Shrubs			
Amelanchier alnifolia (Saskatoon)	1	0-3	12
Artemisia cana (silver sagebrush)	3	0-3	12
Chrysothamnus viscidiflorus (green rabbitbrush)	1	0-3	12
Clematis ligusticifolia (western clematis)	7	0-40	28
Cornus stolonifera (red-osier dogwood)	1	0-1	20
Elaeagnus angustifolia (Russian olive)	1	0-1	12
Juniperus scopulorum (Rocky Mountain juniper)	1	0-3	28
Parthenocissus quinquefolia (Virginia creeper)	2	0-3	24
Prunus virginiana (choke cherry)	9	0-30	24
Rhus radicans (poison ivy)	17	0-20	24
Rhus trilobata (skunkbush)	2	0-3	16
Ribes aureum (golden currant)	2	0-3	20
Ribes oxyacanthoides (northern gooseberry)	5	0-10	8
Ribes spp. (currant)	1	0-1	4
Rosa woodsii (common wild rose)	26	0-98	60
Rosa spp. (rose)	11	0-20	20
Salix amygdaloides (peach-leaved willow)	3	0-10	20
Salix exigua (sandbar willow)	37	0-80	20
Salix lutea (yellow willow)	13	0-60	28
Sarcobatus vermiculatus (greasewood)	10	0-10	4
Shepherdia argentea (thorny buffaloberry)	11	0-90	44
Symphoricarpos occidentalis (buckbrush)	28	0-80	88
Vitis riparia (riverbank grape)	10	0-20	16
Graminoids			
Agropyron dasystachyum (northern wheat grass)	3	0-3	4
Agropyron pectiniforme (crested wheat grass)	3	0-3	8
Agropyron repens (quack grass)	4	0-10	24
Agropyron smithii (western wheat grass)	32	0-70	28

TABLE 15.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Agrostis stolonifera (redtop)	14	0-40	12
Agropyron trachycaulum (slender wheat grass)	10	0-10	4
Bouteloua gracilis (blue grama)	1	0-1	4
Bromus inermis (awnless brome)	14	0-60	52
Bromus japonicus (Japanese chess)	10	0-10	4
Bromus tectorum (downy chess)	20	0-20	4
Carex lanuginosa (woolly sedge)	3	0-3	4
Carex rossii (Ross' sedge)	3	0-3	4
Carex sprengelii (Sprengel's sedge)	3	0-3	4
Eleocharis palustris (creeping spike-rush)	1	0-1	4
Elymus canadensis (Canada wild rye)	9	0-20	44
Hordeum jubatum (foxtail barley)	8	0-20	16
Muhlenbergia racemosa (marsh muhly)	5	0-20	28
Poa interior (inland bluegrass)	3	0-3	4
Poa juncifolia (alkali bluegrass)	1	0-1	4
Poa palustris (fowl bluegrass)	15	0-40	12
Poa pratensis (Kentucky bluegrass)	22	0-60	24
Poa spp. (bluegrass)	11	0-20	16
Polypogon monspeliensis (rabbitfoot grass)	3	0-3	4
Setaria viridis (green foxtail)	1	0-1	4
Spartina pectinata (prairie cord grass)	3	0-3	4
Stipa comata (needle-and-thread)	5	0-10	8
Stipa viridula (green needle grass)	1	0-3	12
Forbs			
Achillea millefolium (common yarrow)	1	0-1	8
Ambrosia psilostachya (perennial ragweed)	3	0-3	4
Anemone cylindrica (long-fruited anemone)	1	0-1	4
Apocynum androsaemifolium (spreading dogbane)	20	0-20	4
Apocynum cannabinum (Indian hemp)	1	0-1	4
Artemisia ludoviciana (prairie sagewort)	1	0-3	24
Asclepias speciosa (showy milkweed)	1	0-1	4
Asclepias verticillata (whorled milkweed)	1	0-1	12
Asparagus officinalis (asparagus)	1	0-1	4
Campanula rotundifolia (harebell)	1	0-1	4
Centaurea repens (Russian knapweed)	3	0-3	4
Chenopodium spp. (goosefoot)	3	0-3	8
Cirsium arvense (Canada thistle)	6	0-20	32
Descurainia sophia (flixweed)	10	0-10	4
Euphorbia esula (leafy spurge)	40	0-40	4
Glycyrrhiza lepidota (wild licorice)	5	0-20	44
Grindelia squarrosa (gumweed)	2	0-3	8
Medicago sativa (alfalfa)	20	0-20	4
Melilotus alba (white sweet-clover)	11	0-30	12
Melilotus officinalis (yellow sweet-clover)	12	0-20	8
Mentha arvensis (wild mint)	3	0-3	4
Moehringia lateriflora (blunt-leaved sandwort)	1	0-1	4
Plantago major (common plantain)	3	0-3	4
Ratibida columnifera (prairie coneflower)	1	0-1	4
Rumex crispus (curled dock)	10	0-20	8
Rumex maritimus (golden dock)	1	0-1	4
Smilacina stellata (star-flowered Solomon's-seal)	7	0-20	32
Solidago canadensis (Canada goldenrod)	12	0-20	8
Solidago spp. (goldenrod)	3	0-3	4
Solidago gigantea (late goldenrod)	8	0-20	16
Sonchus arvensis (perennial sow-thistle)	28	0-80	12
Taraxacum officinale (common dandelion)	1	0-3	12
Thermopsis rhombifolia (golden bean)	10	0-20	8
Tragopogon dubius (common goat's-beard)	1	0-1	4
Vicia americana (wild vetch)	2	0-3	20
Viola adunca (early blue violet)	3	0-3	4
Ferns and Allies			
Equisetum arvense (common horsetail)	1	0-1	8
Equisetum laevigatum (smooth scouring-rush)	1	0-1	4

SUCCESSIONAL INFORMATION

The *Populus deltoides/Symphoricarpos occidentalis* (plains cottonwood/buckbrush) community type is a moderately disturbed secondary successional stage of the mid-seral *Populus deltoides/Cornus stolonifera* (plains cottonwood/red-osier dogwood) community type.

Primary Successional Stages

Cottonwoods are a pioneering species that for establishment require moist, barren, newly deposited alluvium that is exposed to full sunlight. In general, these sites represent point bars, sidebars, mid channel bars, delta bars, and islands along major streams. Since cottonwoods are a pioneering species, and do not regenerate in their own shade, they are considered a seral species and do not represent the climax vegetation or potential for the site. Many stands may appear to have some limited regeneration, especially in open areas. However, it is important to understand that these young plants represent root sprouts (asexual reproduction), not establishment by seeds (sexual reproduction). These sprouts may prolong the life of the stand, but will not perpetuate it. If the site is left undisturbed, in time the cottonwoods will be replaced by a later successional stage.

Erosion and deposition along a river help maintain plant community diversity on its floodplain. Distribution of the various plant communities depends on the river dynamics. Channel migration rate determines the proportion of floodplain communities in early seral, mid seral, late seral, or climax (PNC) successional stage. If the migration rate is high, few stands progress to late successional stage. Near the outer edges of the floodplain, effect of the river is reduced, allowing more late stages to develop. Lateral movement of the river initiates a dynamic series of vegetation events. The stream erodes its banks on outside curves, typically covered with riparian vegetation in later successional stages. The stream then deposits fresh alluvium on point bars along inside curves. Each new alluvial deposit adds to or forms a distinct band or terrace supporting a vegetation community of a different age. The bands generally are progressively older as one moves away from the channel and onto higher terraces. Parts of the floodplain may remain undisturbed long enough for their elevation to increase enough with respect to the channel that they are rarely, if ever, flooded. These are considered old, mature alluvial terraces, and they may continue development toward climax (PNC) without the modifying influences of floods (Hansen 1989).

Early Seral Stage—The *Populus deltoides*/Recent Alluvial Bar (plains cottonwood/Recent Alluvial Bar) community type is the initial seral stage of this type.

Mid-Seral Stage—If disturbance (human-caused or natural) does not alter or eliminate the stand, the *Populus deltoides*/Recent Alluvial Bar (plains cottonwood/Recent Alluvial Bar) community type will progress to the mid-seral stage *Populus deltoides/Cornus stolonifera* (plains cottonwood/red-osier dogwood) community type. The understory of pole to mature *Populus deltoides* (plains cottonwood) may be dominated by young *Acer negundo* (Manitoba maple), or in some cases, *Fraxinus pennsylvanica* (green ash) trees.

Late Seral to Climax (PNC) Stage—As the cottonwood stand dies, primary succession toward later seral communities will occur unless a flood deposits new sediment suitable for cottonwood seedlings. In the absence of this event, succession continues from the *Populus deltoides/Cornus stolonifera* (plains cottonwood/red-osier dogwood) community type toward some habitat type (potential vegetation of the site). If the cottonwood understory has *Acer negundo* (Manitoba maple) or *Fraxinus pennsylvanica* (green ash) present as the *Populus deltoides* (plains cottonwood) overstory matures, becomes open, and then decadent, *Acer negundo* (Manitoba maple) or *Fraxinus pennsylvanica* (green ash) will replace the cottonwoods. The stand then goes to the *Acer negundo/Prunus virginiana* (Manitoba maple/choke cherry) or the *Fraxinus pennsylvanica/Prunus virginiana* (green ash/choke cherry) habitat type. In many cases when no climax tree species are present, the cottonwood mid seral stage will progress to a shrub habitat type, such as the *Salix lutea/ Cornus stolonifera* (yellow willow/red-osier dogwood) habitat type or the *Artemisia cana/Agropyron smithii* (silver sagebrush/western wheat grass) habitat type.

Secondary Successional Stages

The presence or absence of a particular understory community can aid in determining degree of disturbance (present or historic) on a site. On relatively undisturbed sites, the understory under a *Populus deltoides* (plains cottonwood) community will be a diverse, dense layer of shrubs dominated by *Cornus stolonifera* (red-osier dogwood), *Amelanchier alnifolia* (Saskatoon), *Prunus virginiana* (choke cherry), and various species of *Salix* (willows) and *Ribes* (currants and gooseberries). This stage is the *Populus deltoides/Cornus stolonifera* (plains cottonwood/red-osier dogwood) community type.

With moderate levels of grazing or browsing, *Symphoricarpos occidentalis* (buckbrush) and *Rosa* species (rose) will increase, and a corresponding decrease in *Cornus stolonifera* (red-osier dogwood), *Amelanchier alnifolia* (Saskatoon), *Prunus virginiana* (choke cherry), and *Ribes* species (currants and gooseberries) will occur. If browsing pressure continues, the more desirable shrubs will be eliminated, leaving *Symphoricarpos occidentalis* (buckbrush) and *Rosa* species (rose), which can form a nearly impenetrable understory. This stage of disturbance-caused secondary succession is the *Populus deltoides/Symphoricarpos occidentalis* (plains cottonwood/buckbrush) community type. If very severe disturbance continues, ***ALL*** shrubs can be eliminated and the understory converted to herbaceous domination by species such as *Poa pratensis* (Kentucky bluegrass), *Phleum pratense* (timothy), *Bromus inermis* (awnless brome), and a variety of "weedy" forbs. This severely altered state is the *Populus deltoides*/Herbaceous (plains cottonwood/Herbaceous) community type. In this situation, the overstory of *Populus deltoides* (plains cottonwood) still matures and becomes open with an herbaceous understory. Finally the stand becomes one of widely spaced, dying cottonwoods. The site now can be so open and dry that its potential changes from trees or tall shrubs to one of the drier riparian types: the *Artemisia cana/Agropyron smithii* (silver sagebrush/western wheat grass) habitat type, the *Sarcobatus vermiculatus/Agropyron smithii* (greasewood/western wheat grass) habitat type, or the *Agropyron smithii* (western wheat grass) habitat type.

Once the stand has been converted from a shrub-dominated understory to one dominated by introduced herbaceous species, the capacity of the site to return to its former state is very limited. It may be possible, but will require drastic change in management and may be very costly. Therefore, if a manager wants to maintain the stand in a state of shrub understory domination, the most cost effective way is to change management ***BEFORE*** the site is too degraded.

SOILS

Soils are typically Regosols, usually with up to 1 m (39 in) of fine textured mineral material overlying sand or gravel. Brunisols and Chernozems can also be found on older sites of relatively longer stability where time has allowed more development to occur. Texture varies from silt loam to silty clay. Water tables drop below 1 m (39 in) of the surface in summer, but surface horizons often remain moist due to fine textures, associated low permeability, and dense shading by woody plants. As evidence of fluctuating water table, redox concentrations (mottles) are common in these soils, which are generally poorly drained with high available water content.

ADJACENT COMMUNITIES

Adjacent wetter communities may be dominated by a variety of types including the *Salix exigua* (sandbar willow) community type, types dominated by *Salix lutea* (yellow willow), or the *Typha latifolia* (common cattail), *Scirpus* species (bulrush), and *Eleocharis* (spike rush) habitat types. In some situations, this type may be adjacent to open water.

Adjacent drier communities may be the *Artemisia cana/Agropyron smithii* (silver sagebrush/western wheat grass) habitat type, the *Sarcobatus vermiculatus/Agropyron smithii* (greasewood/western wheat grass) habitat type, the *Agropyron smithii* (western wheat grass) habitat type, or by a variety of upland communities.

MANAGEMENT INFORMATION

Livestock

Forage production ranges from low to moderate due to the dense shrub understory within the stands. Forage production from dense thickets of *Symphoricarpos occidentalis* (buckbrush) and *Rosa* species (rose) is low. Stands may be so dense that they preclude most livestock use. As the shrub understory is reduced by prolonged heavy utilization, the stands open and forage production actually increases due to the replacement by *Agropyron smithii* (western wheat grass), *Poa pratensis* (Kentucky bluegrass), *Phleum pratense* (timothy), and *Bromus inermis* (awnless brome). Palatability of *Symphoricarpos occidentalis* (buckbrush) ranges from low to fair for cattle and somewhat higher for sheep (Wasser 1982, Johnson and Nichols 1982, Harrison 2000), and the leaves of *Rosa woodsii* (common wild rose) are considered fair to fairly good livestock forage, particularly for sheep (Johnson and Nichols 1982).

Timber

The timber productivity of all cottonwood types is moderate to high due to favourable moisture conditions. Complete stand removal will likely result in a shrub-dominated community with extremely limited, if any, cottonwood regeneration. The occasional sprouts from stumps are unlikely to reach maturity.

Wildlife

The *Populus deltoides/Symphoricarpos occidentalis* (plains cottonwood/buckbrush) community type provides valuable cover, shade, and food for a variety of species. Big game use, by such species as whitetail and mule deer, may be high, depending upon the time of year. The spreading crown of *Populus deltoides* (plains cottonwood) provides sites for the huge platform-like stick nests of bald eagles and ospreys (Arno and Hammerly 1984) and for great blue herons (Parker 1980). Canada geese occasionally use the nests previously built by bald eagles and osprey. A variety of birds and mammals, such as woodpeckers, great horned owls, wood ducks, and raccoons, nest in trunk cavities. *Populus deltoides* (plains cottonwood) is used by beaver for food and building materials (Allen 1983). Understory species provide food and cover for waterfowl, small birds, and mammals (Dittberner and Olson 1983).

The moderate structural diversity of the *Symphoricarpos occidentalis* (buckbrush) and *Rosa* species (rose) understory provides thermal and hiding cover for big game and upland bird species. The palatability of *Symphoricarpos occidentalis* (buckbrush) is rated good for deer and elk (Wasser 1982, Johnson and Nichols 1982). Deer and elk may browse heavily on *Rosa woodsii* (common wild rose), and the persistent fruit (rose hips) provide fall and winter food for birds, small mammals, and bears, which disperse the seeds. *Rosa woodsii* (common wild rose) is highly tolerant of grazing, but can be dwarfed and thinned by intense season long use.

Fisheries

The streamside location of the *Populus deltoides/Symphoricarpos occidentalis* (plains cottonwood/buckbrush) community type provides very important thermal cover, debris, and streambank stability. Its importance cannot be emphasized enough (see discussion in the Soil Management and Rehabilitation Opportunities section). Their rhizomatous nature makes *Symphoricarpos occidentalis* (buckbrush) and *Rosa* species (rose) excellent in controlling erosion along streams. .

Fire

The *Populus deltoides/Symphoricarpos occidentalis* (plains cottonwood/buckbrush) community type is susceptible to fire during the late summer and fall. *Populus deltoides* (plains cottonwood) and shrubs associated with this type are adapted to light, and under some conditions, to fires of moderate intensity. Many of these species can produce new sprouts after a burn. The ability of cottonwoods to produce new sprouts following fire seems to be dependent upon three criteria:

1) In general, *Populus balsamifera* (balsam poplar) has a greater sprouting capability than *Populus deltoides* (plains cottonwood).
2) The age of the trees. As cottonwoods mature, the sprouting potential decreases. As the trees reach late maturity, sprouting potential is very limited.
3) The location of the water table. In general, the higher the water table is during the growing season, the greater the survivability of resprouts.

Therefore, if a manager wants to extend the life of a cottonwood stand, fire ***MAY BE*** used as a tool in the pole to early mature stage of development. If fire is used to rehabilitate a stand, it is imperative that the stand is excluded from all livestock grazing for at least five years and that wildlife browsing be closely monitored.

Symphoricarpos occidentalis (buckbrush) is tolerant of fire. It can be injured by fire, but it usually sprouts, with stands becoming denser afterward. It is such a strong competitor, particularly in dense colonies, that it is not very compatible with most herbaceous vegetation. *Rosa woodsii* (common wild rose) is typically top-killed by fire, but root crowns and underground rhizomes survive low- or moderate-severity fires. However, the shallow root crowns of *Rosa woodsii* (common wild rose) are susceptible to injury, and populations consequently decrease following high-severity fire. *Rosa woodsii* (common wild rose) recovery varies with fire severity. Top-killed plants will sprout from the root crown and underground surviving rhizomes (USDA IFSL 1995).

Soil Management and Rehabilitation Opportunities

Fine textured soils are susceptible to compaction problems. This community type can be subject to some recurring scouring by floods and alluvium deposition. However, stands are relatively stable because of the strong rooting action of the associated species. Management should emphasize the importance of the understory shrub layer in streambank stabilization. This is particularly important on higher gradient stream channels where scouring by seasonal flooding occurs.

Managers should maintain a buffer strip of the *Populus deltoides* (plains cottonwood) dominated community types adjacent to rivers and streams. These buffer strips reduce sedimentation, stabilize streambanks, and slow flood waters.

If the stand still has a fairly high water table, a dramatic change in management (i.e. elimination of livestock grazing and close monitoring of wildlife impacts) ***MAY*** allow the remnant shrub population to sprout and re-invade the stand. However, if the water table has dropped dramatically and the shrubs have been eliminated, the opportunity to re-establish a shrub understory dominated by desirable shrubs may be lost.

Where revegetation with woody shrub species is wanted, desirable shrubs such as *Cornus stolonifera* (red-osier dogwood), *Amelanchier alnifolia* (Saskatoon), *Prunus virginiana* (choke cherry), and various species of *Salix* (willows) and *Ribes* (currants and gooseberries) may be well adapted to planting on disturbed sites. Rooted cuttings or nursery grown seedlings are easily established on moist, well-drained soils. Growth rates are rapid and the roots of established seedlings effectively stabilize recent bare alluvium. Remember: If the canopy cover of the trees in the stand has opened up too much and/or the water table has been lowered dramatically, the success of revegetation with desirable woody shrub species will be low.

For rehabilitation of stands by the use of fire, see the discussion in the Fire Management section about the limitations of fire as a tool for rehabilitation. If fire is to be used to rehabilitate a stand, it is imperative that the stand is excluded from all livestock grazing for at least five years and that browsing by wildlife be closely monitored.

The following guidelines should be followed when attempting to revegetate sites with cuttings from cottonwoods (Swenson 1988): 1) Do not plant cottonwoods in saline or alkaline sites. 2) Select sites with substrates of sand, gravel, or small cobbles. Avoid sites that are classified as clays or have a thick clay layer. 3) Make cuttings from stands of open, young, rapidly growing trees, using only cuttings that are four years old or less. Remove the side branches, leaving only the tip and next two lower side branches. 4) Make the cuttings when the plants are completely dormant. 5) Soak the cuttings in water for 10 to 14 days. 6) Auger holes to a depth of the lowest anticipated growing season water table. 7) Place the cuttings in the augered holes the same day they are removed from the soak. Set the butt at the lowest anticipated growing season groundwater depth. Select cuttings of a length that provides 1 to 2 m (3 to 6 ft) of cutting to remain above the soil surface. 8) Back fill the holes carefully to avoid air pockets. 9) Place tree guards around the cuttings if rodent or rabbit damage is anticipated. 10) As buds begin to swell along the cuttings, wipe them off the lower two-thirds of the cutting. 11) Plantings must be excluded from livestock grazing and big game browsing for two to three growing seasons. Some beaver control may be needed.

Symphoricarpos occidentalis (buckbrush) is well adapted for revegetating sites. Commonly growing in dense colony stands makes it suitable for disturbed land stabilization. It does best on moist, well-drained soils that have not been excessively disturbed. Once established, it grows at a moderate rate and spreads rapidly by root sprouts. Nursery grown seedlings, rooted cuttings, or wildlings are the preferred planting materials. Critical, erosive sites may need complete exclusion from grazing during establishment, and animal populations and stacking rates should be balanced with forage supply on noncritical sites after establishment (Wasser 1982).

Rosa woodsii (common wild rose) is valuable for revegetating disturbed sites along streambanks and seeps. It is easily established from nursery-grown stock, root cuttings, or transplanted materials.

Recreational Uses and Considerations

Because of its proximity to streams and flat topography, recreational developments and transportation corridors are common in this type. Recreational opportunities are excellent for fishing, big game, and waterfowl hunting, and observing a variety of bird species.

Care must be taken when locating structures within this type. Some campgrounds have been seriously damaged by floods or lost altogether.

Symphoricarpos occidentalis (buckbrush) is an important food source for upland birds due to fruits that persist into the winter. The persistent rose hips are edible, and are one of the best natural sources of vitamin C. They can be dried for use in flavouring teas, jellies, fruitcakes, and puddings. Nature trails should be routed around dense stands of *Rosa woodsii* (common wild rose) community type. However, *Rosa woodsii* (common wild rose) is useful for planting in recreation areas as a biological barrier to protect physical structures, young and delicate plants, and to direct traffic.

OTHER STUDIES

The *Populus deltoides/Symphoricarpos occidentalis* (plains cottonwood/buckbrush) community type is described by Hansen and others (1995) for the northern Great Plains portion of Montana. Similar communities have been described by Nelson (1961), Jorgensen (1979), Boggs (1984), and Hansen and others (1984).

Populus tremuloides/Cornus stolonifera Habitat Type (Aspen/Red-Osier Dogwood Habitat Type)

POPUTRE/CORNSTO
Number of Stands Sampled = 21
Number of Stands Sampled in Saskatchewan = 4

LOCATION AND ASSOCIATED LANDFORMS

The *Populus tremuloides/Cornus stolonifera* (aspen/red-osier dogwood) habitat type is a major late seral/climax type occurring around pothole depressions, near streams and rivers on alluvial terraces and steep valley walls, or near springs and seeps in the Aspen Parkland Ecoregion of south-central Saskatchewan, and a minor type in other parts of the Prairie Ecozone.

VEGETATION

This type is characterized by an overstory of *Populus tremuloides* (aspen) dominating an undergrowth of dense shrubs including *Cornus stolonifera* (red-osier dogwood), *Amelanchier alnifolia* (Saskatoon), *Rosa* species (rose), *Rubus idaeus* (wild red raspberry), and *Prunus virginiana* (choke cherry) (Table 16).

Table 16. Average canopy cover, range of canopy cover, and constancy for species recorded in 7 late seral to climax stands of the *Populus tremuloides/Cornus stolonifera* (aspen/red-osier dogwood) habitat type

TABLE 16.	**% Can. Cov.**		
Species	**Avg.**	**Rng.**	**Con.**
Trees			
Betula papyrifera (white birch)	1	0-1	14
Picea glauca (white spruce)	1	0-1	14
Populus angustifolia (narrow-leaf cottonwood)	10	0-10	14
Populus balsamifera (balsam poplar)	27	0-50	29
Populus tremuloides (aspen)	44	10-60	100
Shrubs			
Amelanchier alnifolia (Saskatoon)	11	3-20	100
Arctostaphylos uva-ursi (common bearberry)	1	0-1	14
Betula occidentalis (water birch)	1	0-1	29
Clematis occidentalis (purple clematis)	2	0-3	29
Cornus stolonifera (red-osier dogwood)	15	3-20	100
Corylus cornuta (beaked hazelnut)	3	0-3	29
Elaeagnus commutata (silverberry)	3	0-3	14
Lonicera spp. (honeysuckle)	3	0-3	14
Lonicera involucrata (bracted honeysuckle)	1	0-1	14
Prunus pensylvanica (pin cherry)	1	0-1	14
Prunus virginiana (choke cherry)	12	0-30	86
Ribes americanum (wild black currant)	10	0-10	14

TABLE 16.	**% Can. Cov.**		
Species	**Avg.**	**Rng.**	**Con.**
Ribes oxyacanthoides (northern gooseberry)	1	0-3	43
Rosa spp. (rose)	6	1-20	100
Rubus idaeus (wild red raspberry)	9	0-20	71
Rubus pubescens (dewberry)	1	0-1	14
Salix bebbiana (beaked willow)	5	0-10	29
Salix scouleriana (Scouler's willow)	3	0-3	14
Shepherdia canadensis (Canada buffaloberry)	2	0-3	29
Spiraea alba (narrow-leaved meadowsweet)	1	0-1	14
Symphoricarpos albus (snowberry)	3	0-3	29
Symphoricarpos occidentalis (buckbrush)	4	0-10	71
Viburnum edule (low-bush cranberry)	7	0-10	29
Graminoids			
Agropyron dasystachyum (northern wheat grass)	1	0-1	14
Agropyron trachycaulum (slender wheat grass)	1	0-1	14
Bromus inermis (awnless brome)	10	0-10	14
Calamagrostis canadensis (bluejoint)	2	0-3	29
Calamagrostis spp. (reed grass)	10	0-10	14
Carex deweyana (Dewey's sedge)	1	0-1	14
Carex praegracilis (graceful sedge)	1	0-1	29
Carex sprengelii (Sprengel's sedge)	2	0-3	43
Festuca idahoensis (bluebunch fescue)	1	0-1	14
Unknown Grass	1	0-1	14
Poa pratensis (Kentucky bluegrass)	10	0-10	29
Forbs			
Achillea millefolium (common yarrow)	1	0-1	29
Actaea rubra (red and white baneberry)	2	0-3	29
Aralia nudicaulis (wild sarsaparilla)	8	0-10	57
Aster ciliolatus (Lindley's aster)	1	0-3	43
Aster conspicuus (showy aster)	1	0-1	29
Disporum trachycarpum (fairybells)	1	0-1	43
Epilobium angustifolium (common fireweed)	1	0-1	29
Fragaria virginiana (wild strawberry)	1	0-3	57
Galium boreale (northern bedstraw)	4	0-10	57
Galium triflorum (sweet-scented bedstraw)	1	0-3	43
Geranium richardsonii (wild white geranium)	5	0-10	29
Geum macrophyllum (large-leaved yellow avens)	1	0-1	14
Heracleum lanatum (cow parsnip)	3	0-3	14
Lilium philadelphicum (western wood lily)	1	0-1	14
Medicago lupulina (black medick)	1	0-1	14
Mertensia paniculata (tall lungwort)	2	0-3	29
Mitella nuda (bishop's-cap)	3	0-3	14
Orthilia secunda (one-sided wintergreen)	1	0-1	14
Pyrola asarifolia (common pink wintergreen)	1	0-3	43
Ranunculus abortivus (small-flowered buttercup)	3	0-3	14
Senecio pauperculus (balsam groundsel)	3	0-3	14
Silene menziesii (Menzies' catchfly)	1	0-1	14
Smilacina stellata (star-flowered Solomon's-seal)	1	1-3	100
Solidago spp. (goldenrod)	1	0-1	29
Taraxacum officinale (common dandelion)	1	0-1	29
Thalictrum spp. (meadow rue)	1	0-1	29
Thalictrum venulosum (veiny meadow rue)	1	0-3	43
Urtica dioica (common nettle)	1	0-1	14
Vicia americana (wild vetch)	1	0-1	57
Viola spp. (violet)	1	0-1	14
Viola canadensis (western Canada violet)	10	0-10	29
Zizia aptera (heart-leaved Alexanders)	1	0-1	14
Ferns and Allies			
Equisetum arvense (common horsetail)	2	0-3	29

SUCCESSIONAL INFORMATION

This type is the late seral/climax stage of vegetation on moist sites dominated by *Populus tremuloides* (aspen) on the Prairie Ecozone of Canada. High levels of grazing and browsing by livestock and wildlife will reduce the coverages and successful reproduction of *Populus* *tremuloides* (aspen) and the various shrubs associated with this type, while increasing the coverages of disturbance-caused herbaceous species. In extreme cases, a loss of the woody understory may occur, and the stand will take on the appearance of the grazing or browsing disclimax *Populus tremuloides/*Herbaceous (aspen/herbaceous) community type (Table 17).

Table 17. Average canopy cover, range of canopy cover, and constancy for species recorded in 14 early seral and disturbed stands of the *Populus tremuloides/Cornus stolonifera* (aspen/red-osier dogwood) habitat type

TABLE 17.	**% Can. Cov.**		
Species	**Avg.**	**Rng.**	**Con.**
Trees			
Picea glauca (white spruce)	3	0-3	7
Populus balsamifera (balsam poplar)	21	0-60	21
Populus tremuloides (aspen)	64	10-90	100
Shrubs			
Amelanchier alnifolia (Saskatoon)	9	0-20	50
Clematis occidentalis (purple clematis)	3	0-3	21
Cornus stolonifera (red-osier dogwood)	19	0-60	71
Crataegus spp. (hawthorn)	3	0-3	7
Crataegus rotundifolia (round-leaved hawthorn)	7	0-10	14
Juniperus scopulorum (Rocky Mountain juniper)	1	0-1	7
Prunus pensylvanica (pin cherry)	1	0-1	7
Prunus virginiana (choke cherry)	7	0-20	50
Ribes hudsonianum (northern black currant)	3	0-3	7
Ribes oxyacanthoides (northern gooseberry)	4	0-10	79
Ribes spp. (currant)	2	0-3	14
Rosa woodsii (common wild rose)	20	0-20	7
Rosa spp. (rose)	11	0-30	93
Rubus arcticus (dwarf raspberry)	3	0-3	7
Rubus idaeus (wild red raspberry)	11	0-30	64
Salix bebbiana (beaked willow)	12	0-50	64
Salix petiolaris (basket willow)	2	0-3	14
Shepherdia canadensis (Canada buffaloberry)	1	0-1	14
Symphoricarpos albus (snowberry)	5	0-10	21
Symphoricarpos occidentalis (buckbrush)	22	0-50	71
Graminoids			
Agropyron dasystachyum (northern wheat grass)	3	0-3	7
Agropyron smithii (western wheat grass)	10	0-10	7
Agrostis stolonifera (redtop)	3	0-3	7
Agropyron trachycaulum (slender wheat grass)	3	0-3	7
Bromus ciliatus (fringed brome)	1	0-1	14
Bromus inermis (awnless brome)	36	0-90	64
Calamagrostis canadensis (bluejoint)	10	0-10	7
Carex atherodes (awned sedge)	20	0-20	7
Carex lanuginosa (woolly sedge)	3	0-3	7
Carex microglochin (short-awned sedge)	1	0-1	7
Carex praegracilis (graceful sedge)	3	0-3	7
Carex scopulorum (Holn's Rocky Mountain sedge)	3	0-3	7
Carex sprengelii (Sprengel's sedge)	2	0-3	21
Carex xerantica (white-scaled sedge)	3	0-3	7
Carex spp. (sedge)	2	0-3	14
Elymus glaucus (smooth wild rye)	1	0-1	7
Elymus innovatus (hairy wild rye)	1	0-1	7
Elymus virginicus (Virginia wild rye)	10	0-10	7
Phleum pratense (timothy)	4	0-10	36
Poa palustris (fowl bluegrass)	2	0-3	21
Poa pratensis (Kentucky bluegrass)	18	0-40	57
Forbs			
Achillea millefolium (common yarrow)	1	0-3	21
Actaea rubra (red and white baneberry)	1	0-1	21
Agrimonia striata (agrimony)	10	0-10	7
Anemone cylindrica (long-fruited anemone)	1	0-1	7
Aster ascendens (western aster)	3	0-3	7
Aster ciliolatus (Lindley's aster)	1	0-1	7
Aster conspicuus (showy aster)	1	0-1	7
Aster ericoides (tufted white prairie aster)	1	0-1	7
Aster laevis (smooth aster)	7	0-10	14
Aster spp. (aster)	1	0-1	7
Aster subspicatus (leafy-bracted aster)	1	0-1	7
Campanula rotundifolia (harebell)	1	0-1	7
Cirsium arvense (Canada thistle)	5	0-20	36
Clintonia uniflora (corn lily)	1	0-1	7

TABLE 17.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Disporum trachycarpum (fairybells)	1	0-1	7
Epilobium angustifolium (common fireweed)	10	0-20	14
Epilobium ciliatum (northern willowherb)	3	0-3	7
Unknown Forb	2	0-3	21
Fragaria virginiana (wild strawberry)	3	0-3	50
Galium boreale (northern bedstraw)	3	0-3	64
Galium triflorum (sweet-scented bedstraw)	1	0-3	29
Geranium richardsonii (wild white geranium)	2	0-3	50
Geum aleppicum (yellow avens)	2	0-3	14
Geum macrophyllum (large-leaved yellow avens)	1	0-3	29
Heracleum lanatum (cow parsnip)	1	0-3	21
Hieracium umbellatum (narrow-leaved hawkweed)	1	0-1	7
Lathyrus ochroleucus (cream-colored vetchling)	1	0-1	43
Mertensia paniculata (tall lungwort)	3	0-3	7
Moehringia lateriflora (blunt-leaved sandwort)	1	0-1	7
Monarda fistulosa (wild bergamot)	1	0-1	21
Osmorhiza chilensis (blunt-fruited sweet cicely)	1	0-1	7
Osmorhiza depauperata (spreading sweet cicely)	2	0-3	14
Perideridia gairdneri (squawroot)	1	0-1	7
Plantago major (common plantain)	1	0-1	7
Polygonum amphibium (water smartweed)	3	0-3	7
Potentilla gracilis (graceful cinquefoil)	1	0-1	7
Potentilla paradoxa (bushy cinquefoil)	1	0-1	7
Prunella vulgaris (heal-all)	1	0-1	7
Pyrola asarifolia (common pink wintergreen)	5	0-10	14
Ranunculus acris (tall buttercup)	1	0-1	7
Sanicula marilandica (snakeroot)	3	0-3	14
Senecio pauperculus (balsam groundsel)	2	0-3	14
Silene menziesii (Menzies' catchfly)	1	0-1	7
Smilax herbacea (Carrionflower)	1	0-1	7
Smilacina stellata (star-flowered Solomon's-seal)	6	0-20	64
Solidago canadensis (Canada goldenrod)	1	0-3	36
Solidago gigantea (late goldenrod)	1	0-1	7
Sonchus arvensis (perennial sow-thistle)	1	0-1	7
Stachys palustris (marsh hedge-nettle)	2	0-3	14
Taraxacum officinale (common dandelion)	2	0-3	64
Thalictrum occidentale (western meadow rue)	2	0-3	14
Thalictrum venulosum (veiny meadow rue)	4	0-10	57
Urtica dioica (common nettle)	2	0-3	14
Vicia americana (wild vetch)	2	0-10	57
Viola adunca (early blue violet)	1	0-1	7
Viola canadensis (western Canada violet)	8	0-10	29
Zizia aurea (golden Alexanders)	1	0-1	7
Ferns and Allies			
Equisetum arvense (common horsetail)	11	0-20	21

SOILS

Soils are typically dark brown Chernozems. Sites adjacent to streams are often shallow Regosols overlying river cobbles. Soil textures vary from silt loam to sand. Water tables average 30 cm (12 in) below the surface in mid-summer, but water depths of several stands were greater than one meter. Coarse textured soils, moderate stream gradients, and high coarse fragment contents throughout the soil profile provide an environment that produces a rapid movement of highly aerated groundwater. This type of substrate is important to many floodplain communities.

ADJACENT COMMUNITIES

Adjacent wetter communities are often dominated by *Carex atherodes* (awned sedge), *Scirpus acutus* (great bulrush), *Typha latifolia* (common cattail), *Salix bebbiana* (beaked willow), *Salix petiolaris* (basket willow), or occasionally *Populus balsamifera* (balsam poplar). Drier sites are uplands dominated by steppe vegetation.

MANAGEMENT INFORMATION

Livestock

Forage production varies from low to moderate, depending on the density of the tree and shrub layer. Palatability of the various herbaceous species associated with this type are often high, and cattle use may be heavy as upland vegetation cures and animals spend much of their time in the shade provided by these communities. Livestock will use this type for forage, shade, and as bedding ground. They also browse young suckers and, combined with trampling and soil compaction, can alter both age structure and herbaceous layer of this type. *Cornus stolonifera* (red-osier dogwood) is considered an "ice cream" plant by livestock and wildlife. Its utilization is a direct indication of past and current use levels. In some areas, livestock browsing of *Cornus stolonifera* (red-osier dogwood) may be quite high.

Overuse by livestock will result in a reduced vigour by the willows present, as illustrated by highlining, clubbing, or dead clumps. With continued overuse, willows will show a sharp decline in vigour, and they may be eventually eliminated from the site.

Timber

Most timber harvest is salvage for fuelwood. Overstory removal will result in sprouting of young aspen that are susceptible to grazing pressure.

Wildlife

The *Populus tremuloides/Cornus stolonifera* (aspen/red-osier dogwood) habitat type, although often covering only small areas, has high value as wildlife cover and feeding areas. Beaver, if present, may make heavy use of *Populus tremuloides* (aspen) stands (Allen 1983). Wild ungulates such as deer and elk browse young suckers and occasionally feed on the bark of older trees. Use by elk during spring, fall, and winter periods is often moderate to heavy (Kufeld 1973). *Populus tremuloides* (aspen) and *Cornus stolonifera* (red-osier dogwood) are highly preferred by moose (Costain 1989). Use of this type as bedding grounds by wildlife is also common.

Numerous bird species frequent communities dominated by *Populus tremuloides* (aspen). Common species nesting and feeding in this type include flickers, chickadees, sapsuckers, and woodpeckers.

Fisheries

Where adjacent to streams, stands of this type enhance fisheries by stabilizing banks and providing overhanging cover. *Cornus stolonifera* (red-osier dogwood) is an excellent shrub for controlling erosion along streams. This is particularly important on the higher gradient streams where scouring by seasonal flooding is possible.

Fire

Wet conditions in the spring and summer tend to limit successful burning to the drier fall period. Fire, sometimes in combination with cutting, is becoming an increasingly important tool in regenerating decadent stands of *Populus tremuloides* (aspen) (Jones and DeByle 1985). Brown (1984) provides information for using prescribed fire in stands of *Populus tremuloides* (aspen). Protection of newly burned or cleared sites from beaver and grazing animals may be necessary for successful reproduction.

Cornus stolonifera (red-osier dogwood) and the associated shrub species can survive all but the most severe fires that remove duff and cause extended heating of the upper layer of soil. After a fire, the shrub sprouts from the surviving rhizomes or stolons (runners) (Fischer and Bradley 1987).

Soil Management and Rehabilitation Opportunities

Soils compaction is likely when repeated animal use occurs on moist soils. Grazing should be deferred to periods when soils and streambanks are drier (Marlow 1984).

Populus tremuloides (aspen) may be useful in revegetating disturbed sites having moist, well-drained soils. Best results are obtained using rooted cuttings or nursery-grown stock. Once established, growth rates are rapid. The quickly spreading roots of *Populus tremuloides* (aspen) effectively stabilize soils.

Where revegetation with woody shrub species is desired, *Cornus stolonifera* (red-osier dogwood), *Amelanchier alnifolia* (Saskatoon), *Prunus virginiana* (choke cherry), and various species of *Salix* (willows) and *Ribes* (currants and gooseberries) may be well adapted to planting on disturbed sites. Rooted cuttings or nursery grown seedlings are easily established on moist, well-drained soils. Growth rates are rapid and the roots of established seedlings are effective stabilizers of alluvial soil deposits.

Recreational Uses and Considerations

Fishing and birding opportunities are often good. Campsites should be located away from stands of this type because of wet soils and large mosquito populations.

OTHER STUDIES

The *Populus tremuloides/Cornus stolonifera* (aspen/red-osier dogwood) habitat type is described by Hansen and others (1995).

Populus tremuloides/Herbaceous Community Type

(Aspen/Herbaceous Community Type)

POPUTRE

Number of Stands Sampled = 11

Number of Stands Sampled in Saskatchewan = 1

CAUTION—Not all sites currently dominated by *Populus tremuloides* (aspen) are considered riparian or wetland sites. In some instances, they are considered upland sites. The topographic position of the site must match the description as presented in the Location and Associated Landform section.

LOCATION AND ASSOCIATED LANDFORMS

The *Populus tremuloides*/Herbaceous (aspen/herbaceous) community type is a major early seral type in the Aspen Parkland Ecoregion of south-central Saskatchewan, and a minor type in other parts of the Prairie Ecozone. This type occurs around pothole depressions, near streams and rivers on alluvial terraces and steep valley walls, or near springs and seeps.

VEGETATION

The *Populus tremuloides*/Herbaceous (aspen/herbaceous) community type represents a grazing or browsing disclimax. This type is what is left after most of the woody plants under a *Populus tremuloides* (aspen) overstory have been eliminated by some kind of disturbance—usually grazing. *Populus tremuloides* (aspen) dominates the overstory of a two layered structure. The understory is dominated by exotic or invader grasses, such as *Bromus inermis* (awnless brome), *Poa pratensis* (Kentucky bluegrass), and *Phleum pratense* (timothy). *Taraxacum officinale* (common dandelion) and *Fragaria virginiana* (wild strawberry) are common forbs (Table 18).

Table 18. Average canopy cover, range of canopy cover, and constancy for those species recorded in 11 sampled stands of the grazing or browsing disclimax *Populus tremuloides*/Herbaceous (aspen/Herbaceous) community type

TABLE 18.	**% Can. Cov.**		
Species	**Avg.**	**Rng.**	**Con.**
Trees			
Picea glauca (white spruce)	1	0-1	18
Populus balsamifera (balsam poplar)	1	0-1	9
Populus tremuloides (aspen)	86	60-98	100
Shrubs			
Amelanchier alnifolia (Saskatoon)	1	0-1	18
Betula glandulosa (bog birch)	1	0-1	9
Elaeagnus commutata (silverberry)	1	0-1	9
Lonicera utahensis (red twinberry)	1	0-1	9
Prunus virginiana (choke cherry)	1	0-1	9
Ribes lacustre (bristly black currant)	1	0-1	9
Ribes oxyacanthoides (northern gooseberry)	2	0-3	36
Rosa woodsii (common wild rose)	10	0-10	9
Rosa spp. (rose)	5	0-10	55
Rubus idaeus (wild red raspberry)	7	0-10	18
Salix bebbiana (beaked willow)	1	0-3	27
Salix lutea (yellow willow)	3	0-3	9
Symphoricarpos albus (snowberry)	1	0-1	9
Symphoricarpos occidentalis (buckbrush)	5	0-10	64
Graminoids			
Agropyron repens (quack grass)	14	0-30	27
Agrostis scabra (rough hair grass)	3	0-3	9
Agrostis stolonifera (redtop)	1	0-1	9
Agropyron trachycaulum (slender wheat grass)	3	0-3	18
Bromus anomalus (nodding brome)	1	0-1	9
Bromus ciliatus (fringed brome)	1	0-1	9
Bromus inermis (awnless brome)	21	0-90	55
Calamagrostis canadensis (bluejoint)	35	0-70	18
Calamagrostis stricta (narrow reed grass)	3	0-3	18
Carex lanuginosa (woolly sedge)	20	0-20	9
Carex spp. (sedge)	1	0-1	9
Elymus canadensis (Canada wild rye)	1	0-1	9
Elymus virginicus (Virginia wild rye)	1	0-1	9
Unknown Grass	1	0-1	9
Hordeum jubatum (foxtail barley)	1	0-1	18
Juncus balticus (wire rush)	3	0-3	9
Muhlenbergia richardsonis (mat muhly)	1	0-1	9
Phleum pratense (timothy)	19	0-30	45
Poa palustris (fowl bluegrass)	12	0-30	36
Poa pratensis (Kentucky bluegrass)	29	0-98	64
Trisetum spp. (trisetum)	3	0-3	9
Forbs			
Achillea millefolium (common yarrow)	2	0-3	18
Actaea rubra (red and white baneberry)	1	0-1	18
Agoseris glauca (yellow false dandelion)	1	0-1	9
Arabis glabra (tower mustard)	1	0-1	9
Artemisia ludoviciana (prairie sagewort)	1	0-1	9
Aster ciliolatus (Lindley's aster)	7	0-10	18
Aster eatonii (Eaton's aster)	3	0-3	9
Aster hesperius (western willow aster)	1	0-3	27
Aster laevis (smooth aster)	3	0-3	18
Campanula rotundifolia (harebell)	1	0-1	9
Carduus nutans (nodding thistle)	1	0-1	9
Cirsium arvense (Canada thistle)	2	0-3	64
Cirsium vulgare (bull thistle)	1	0-1	9
Epilobium angustifolium (common fireweed)	1	0-1	18
Unknown Forb	1	0-1	9
Fragaria virginiana (wild strawberry)	7	0-10	18
Galeopsis tetrahit (hemp-nettle)	3	0-3	9
Galium boreale (northern bedstraw)	1	0-3	55
Geranium richardsonii (wild white geranium)	5	0-10	36
Geum aleppicum (yellow avens)	1	0-1	9
Hackelia americana (nodding stickseed)	1	0-1	9
Heracleum lanatum (cow parsnip)	20	0-40	18
Lathyrus ochroleucus (cream-colored vetchling)	2	0-3	18
Medicago lupulina (black medick)	1	0-1	9
Mentha arvensis (wild mint)	3	0-3	9
Mertensia paniculata (tall lungwort)	3	0-3	9

TABLE 18.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Osmorhiza chilensis (blunt-fruited sweet cicely)	1	0-1	9
Osmorhiza depauperata (spreading sweet cicely)	1	0-1	9
Penstemon procerus (slender blue beardtongue)	1	0-1	9
Perideridia gairdneri (squawroot)	1	0-1	9
Plantago major (common plantain)	1	0-1	9
Potentilla gracilis (graceful cinquefoil)	1	0-1	18
Potentilla norvegica (rough cinquefoil)	3	0-3	9
Ranunculus spp. (ranunculus)	1	0-1	9
Rhinanthus minor (yellow rattle)	1	0-1	9
Rumex crispus (curled dock)	2	0-3	18
Senecio pauperculus (balsam groundsel)	1	0-1	9
Smilacina stellata (star-flowered Solomon's-seal)	1	0-1	9
Solidago canadensis (Canada goldenrod)	5	0-10	18
Sonchus asper (prickly annual sow-thistle)	1	0-1	9
Stachys palustris (marsh hedge-nettle)	1	0-1	9
Stellaria longipes (long-stalked chickweed)	1	0-1	9
Streptopus amplexifolius (clasping-leaved twisted-stalk)	1	0-1	9
Taraxacum officinale (common dandelion)	3	0-10	64
Thalictrum occidentale (western meadow rue)	2	0-3	18
Thalictrum venulosum (veiny meadow rue)	4	0-10	27
Tragopogon dubius (common goat's-beard)	1	0-1	9
Trifolium repens (white clover)	3	0-3	9
Urtica dioica (common nettle)	2	0-3	18
Vicia americana (wild vetch)	2	0-3	45
Viola adunca (early blue violet)	1	0-1	9
Viola spp. (violet)	1	0-1	9
Viola canadensis (western Canada violet)	1	0-1	18
Ferns and Allies			
Equisetum arvense (common horsetail)	5	0-10	18

SUCCESSIONAL INFORMATION

This community type reflects past periods of prolonged animal use. The *Populus tremuloides/*Herbaceous (aspen/herbaceous) community type represents a grazing or browsing disclimax of the *Populus tremuloides/Cornus stolonifera* (aspen/red-osier dogwood) habitat type or *Populus tremuloides/Symphoricarpos occidentalis* (aspen/buckbrush) community type. Loss of the original undergrowth dominants has occurred, and reproduction of *Populus tremuloides* (aspen) has been severely limited. Careful observation of physical and vegetative characteristics may aid in determining the site's potential.

SOILS

Soils are typically dark brown Chernozems. Sites adjacent to streams are often shallow Regosols overlying river cobbles. Soil textures vary from silt loam to sand. Water tables average 30 cm (12 in) below the surface in mid-summer, but water depths of several stands were greater than one meter. Coarse textured soils, moderate stream gradients, and high coarse fragment contents throughout the soil profile provide an environment that produces a rapid movement of highly aerated groundwater. This type of substrate is important to many floodplain communities.

ADJACENT COMMUNITIES

Adjacent wetter communities are often dominated by *Carex atherodes* (awned sedge), *Scirpus acutus* (great bulrush), *Typha latifolia* (common cattail) *Salix bebbiana* (beaked willow), *Salix petiolaris* (basket willow), or occasionally *Populus balsamifera* (balsam poplar). Drier sites are uplands dominated by steppe vegetation.

MANAGEMENT INFORMATION

Livestock

This type is a valuable source of browse and forage for livestock and wildlife. Livestock use this type for shade and as bedding ground. However, persistent grazing and trampling have already caused compositional and structural changes, including the loss of native herbaceous species. Conversion back to the original vegetation is unlikely to occur simply by altering the grazing regime.

Bromus inermis (awnless brome) is a highly palatable and productive grass, especially early in the season when it is green. *Bromus inermis* (awnless brome) is well adapted to grazing and is considered an invader. Streambanks with *Bromus inermis* (awnless brome) are susceptible to sloughing. Many stands of this type are dominated by, or have a large component of, *Poa pratensis* (Kentucky bluegrass). This grass responds to grazing similarly to *Bromus inermis* (awnless brome).

Timber

Most timber harvest is salvage for fuelwood. Overwood removal will result in sprouting of young aspen from suckers. Stand development necessitates protection of young aspen from browsing.

Wildlife

Deer may use this type for early season forage. Cover value for big game is limited because of the typically open, two layered structure. Beaver, if present, may make heavy use of *Populus tremuloides* (aspen) stands (Allen 1983). Wild ungulates such as deer and elk browse young suckers and occasionally feed on the bark of older trees. Use by elk during spring, fall, and winter periods is often moderate to heavy (Kufeld 1973). *Populus tremuloides* (aspen) is highly preferred by moose (Costain 1989). Use of this type as bedding grounds by wildlife is also common. Birds such as redshafted flickers are common, and often nest in cavities of larger aspen. Understory species such as *Agropyron repens* (quack grass), *Rosa* species (rose), and *Symphoricarpos* species (buckbrush) provide food and cover for small mammals and birds, upland game and waterfowl (Dittberner and Olson 1983).

Fire

Populus tremuloides (aspen) responds to fire by producing large numbers of vigorous root suckers. However, livestock and large ungulates should be kept out of newly burned stands if successful regeneration is desired. *Bromus inermis* (awnless brome) is little harmed by fires, especially when moisture levels are adequate to dampen soil temperatures during the burn. However, it is intolerant of burning during the active growth stages and can be successfully controlled by late spring burning. Cool burns will have little effect on *Bromus inermis* (awnless brome) (Wasser 1982), but late spring burns may lower tiller densities (Dix and Smeins 1967) and may be used to control this species (Wasser 1982). Many stands of this type are dominated by, or have a large component of, *Poa pratensis* (Kentucky bluegrass). This grass responds to fire similarly to *Bromus inermis* (awnless brome).

Soil Management and Rehabilitation Opportunities

Moist, fine textured soils are easily compacted and disturbed by livestock in spring and after rain events. Soil compaction is minimal on dry coarse textured soils.

Populus tremuloides (aspen) may be useful in revegetating disturbed sites having moist, well-drained soils. Best results are obtained using rooted cuttings or nursery-grown stock. Once established, growth rates are rapid. The quickly spreading roots of *Populus tremuloides* (aspen) effectively stabilize soils.

On the other hand, *Bromus inermis* (awnless brome) is not very effective in stabilizing streambanks (Youngblood and others 1985b). Bank undercutting and sloughing may occur, especially when soils are wet or stands weakened by excessive grazing.

Recreational Uses and Considerations

If stands are extensive, this community type may provide good campground locations. Overstory aspen provide shade in an often otherwise treeless environment. However, successful aspen reproduction is likely to be reduced or eliminated by trampling. Fencing of selected areas to allow suckers to grow is recommended.

OTHER STUDIES

The *Populus tremuloides*/Herbaceous (aspen/herbaceous) community type has not been previously described. A *Populus tremuloides* (aspen) community is described by Lawrence and Romo (1994) on the Matador Research Station in southern Saskatchewan.

Populus tremuloides/Symphoricarpos occidentalis
Community Type
(Aspen/Buckbrush Community Type)

POPUTRE/SYMPOCC
Number of Stands Sampled = 9
Number of Stands Sampled in Saskatchewan = 2

CAUTION—Not all sites currently dominated by *Populus tremuloides* (aspen) are considered riparian or wetland sites. In some instances, they are considered upland sites. The topographic position of the site must match the description as presented in the Location and Associated Landform section.

LOCATION AND ASSOCIATED LANDFORMS

The *Populus tremuloides/Symphoricarpos occidentalis* (aspen/buckbrush) community type is a major early-to-mid seral type in the Aspen Parkland Ecoregion of south-central Saskatchewan, and a minor type in other parts of the Prairie Ecozone. This type occurs around pothole depressions, near streams and rivers on alluvial terraces and steep valley walls, or near springs and seeps.

VEGETATION

The *Populus tremuloides/Symphoricarpos occidentalis* (aspen/buckbrush) community type results from grazing or browsing disturbance of the *Populus tremuloides/Cornus stolonifera* (aspen/red-osier dogwood) habitat type. This type is what is left after most of the more palatable woody plants under a *Populus tremuloides* (aspen) overstory have been eliminated by large ungulate browsing. *Populus tremuloides* (aspen) dominates the overstory. Shrubs such as *Cornus stolonifera* (red-osier dogwood), *Amelanchier alnifolia* (Saskatoon), *Prunus virginiana* (choke cherry), and *Salix* species (willows) are absent or present in only very small amounts. Other shrubs, such as *Symphoricarpos occidentalis* (buckbrush), *Crataegus* species (hawthorn), *Elaeagnus commutata* (silverberry), *Rosa woodsii* (common wild rose), and *Ribes* species (currants and gooseberries) dominate the understory. (Table 19)

Table 19. Average canopy cover, range of canopy cover, and constancy for those species recorded in 9 sampled stands of the grazing or browsing disclimax *Populus tremuloides/Symphoricarpos occidentalis* (aspen/buckbrush) community type

TABLE 19.	**% Can. Cov.**		
Species	**Avg.**	**Rng.**	**Con.**
Trees			
Acer negundo (Manitoba maple)	3	0-3	11
Populus balsamifera (balsam poplar)	45	0-50	22
Populus tremuloides (aspen)	74	40-98	100
Shrubs			
Amelanchier alnifolia (Saskatoon)	5	0-10	56
Cornus stolonifera (red-osier dogwood)	2	0-3	56
Corylus cornuta (beaked hazelnut)	40	0-40	11
Lonicera involucrata (bracted honeysuckle)	20	0-20	11

TABLE 19.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Prunus virginiana (choke cherry)	5	0-10	44
Ribes americanum (wild black currant)	10	0-20	22
Ribes lacustre (bristly black currant)	1	0-1	11
Ribes oxyacanthoides (northern gooseberry)	2	0-3	22
Ribes spp. (currant)	1	0-1	11
Rosa spp. (rose)	8	0-20	67
Rubus idaeus (wild red raspberry)	10	0-10	22
Rubus parviflorus (thimbleberry)	20	0-20	11
Salix bebbiana (beaked willow)	2	0-3	22
Salix lutea (yellow willow)	1	0-1	11
Salix petiolaris (basket willow)	1	0-1	11
Salix scouleriana (Scouler's willow)	1	0-1	11
Spiraea betulifolia (white meadowsweet)	1	0-1	11
Symphoricarpos albus (snowberry)	20	0-20	22
Symphoricarpos occidentalis (buckbrush)	21	0-60	78
Graminoids			
Agropyron pectiniforme (crested wheat grass)	1	0-1	11
Agropyron repens (quack grass)	10	0-10	11
Agropyron smithii (western wheat grass)	20	0-20	11
Agrostis stolonifera (redtop)	3	0-3	11
Agropyron trachycaulum (slender wheat grass)	3	0-3	11
Bromus carinatus (keeled brome)	3	0-3	11
Bromus ciliatus (fringed brome)	1	0-1	11
Bromus inermis (awnless brome)	52	0-98	44
Bromus spp. (brome)	1	0-1	11
Bromus vulgaris (woodland brome)	1	0-1	11
Calamagrostis canadensis (bluejoint)	3	0-3	11
Carex sprengelii (Sprengel's sedge)	5	0-10	22
Elymus glaucus (smooth wild rye)	20	0-20	11
Elymus virginicus (Virginia wild rye)	3	0-3	33
Festuca spp. (fescue)	10	0-10	11
Juncus balticus (wire rush)	3	0-3	11
Phleum pratense (timothy)	7	0-10	22
Poa pratensis (Kentucky bluegrass)	12	0-20	22
Trisetum canescens (tall trisetum)	1	0-1	11
Trisetum cernuum (nodding trisetum)	3	0-3	11
Forbs			

TABLE 19.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Achillea millefolium (common yarrow)	1	0-3	33
Actaea rubra (red and white baneberry)	8	0-20	44
Angelica arguta (white angelica)	2	0-3	22
Aralia nudicaulis (wild sarsaparilla)	60	0-60	11
Artemisia ludoviciana (prairie sagewort)	3	0-3	11
Aster ciliolatus (Lindley's aster)	10	0-10	11
Aster engelmannii (elegant aster)	1	0-1	11
Aster ericoides (tufted white prairie aster)	1	0-1	11
Aster subspicatus (leafy-bracted aster)	1	0-1	22
Chenopodium fremontii (Fremont's goosefoot)	3	0-3	11
Cirsium arvense (Canada thistle)	2	0-3	22
Disporum hookeri (Oregon fairybells)	1	0-1	11
Disporum trachycarpum (fairybells)	2	0-3	22
Epilobium angustifolium (common fireweed)	1	0-1	11
Unknown Forb	3	0-3	22
Fragaria virginiana (wild strawberry)	1	0-3	44
Galium boreale (northern bedstraw)	1	0-1	33
Galium triflorum (sweet-scented bedstraw)	1	0-3	44
Geranium richardsonii (wild white geranium)	2	0-3	44
Geum aleppicum (yellow avens)	2	0-3	22
Geum macrophyllum (large-leaved yellow avens)	2	0-3	22
Glycyrrhiza lepidota (wild licorice)	2	0-3	33
Grindelia squarrosa (gumweed)	1	0-1	11
Hackelia americana (nodding stickseed)	1	0-1	11
Hackelia jessicae (Jessica's stickseed)	1	0-1	11
Heracleum lanatum (cow parsnip)	10	0-20	22
Lathyrus ochroleucus (cream-colored vetchling)	5	0-10	33
Listera caurina (western twayblade)	1	0-1	11
Osmorhiza chilensis (blunt-fruited sweet cicely)	3	0-3	11
Osmorhiza depauperata (spreading sweet cicely)	1	0-1	11

TABLE 19.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Osmorhiza occidentalis (western sweet cicely)	20	0-20	11
Pedicularis bracteosa (western lousewort)	1	0-1	22
Plantago major (common plantain)	1	0-1	11
Senecio pauperculus (balsam groundsel)	3	0-3	11
Senecio pseudaureus (thin-leaved ragwort)	1	0-1	11
Senecio triangularis (brook ragwort)	3	0-3	11
Silene menziesii (Menzies' catchfly)	1	0-1	11
Sisymbrium loeselii (tall hedge mustard)	1	0-1	11
Smilacina stellata (star-flowered Solomon's-seal)	1	0-1	44
Sonchus arvensis (perennial sow-thistle)	10	0-10	11
Stachys palustris (marsh hedge-nettle)	3	0-3	11
Stellaria americana (American chickweed)	1	0-1	11
Streptopus amplexifolius (clasping-leaved twisted-stalk)	1	0-1	22
Taraxacum officinale (common dandelion)	5	0-10	33
Thalictrum occidentale (western meadow rue)	2	0-3	22
Thalictrum venulosum (veiny meadow rue)	5	0-10	33
Trifolium repens (white clover)	1	0-1	11
Urtica dioica (common nettle)	2	0-3	44
Valeriana dioica (northern valerian)	3	0-3	11
Verbascum thapsus (common mullein)	3	0-3	11
Vicia americana (wild vetch)	1	0-3	33
Viola canadensis (western Canada violet)	5	0-10	33
Melanelia subargentifera	1	0-1	11
Verrucaria virens	1	0-1	22
Ferns and Allies			
Equisetum arvense (common horsetail)	20	0-20	11

SUCCESSIONAL INFORMATION

This community type reflects past periods of prolonged animal use. The *Populus tremuloides/Symphoricarpos occidentalis* (aspen/buckbrush) community type represents a grazing or browsing disclimax of the *Populus tremuloides/Cornus stolonifera* (aspen/red-osier dogwood) habitat type. The original shrub understory has been altered, and continued disturbance may further change the community by eliminating the shrub component and leaving only herbaceous species. Careful observation of physical and vegetative characteristics may aid in determining the site's potential.

SOILS

Soils are typically dark brown Chernozems. Sites adjacent to streams are often shallow Regosols overlying river cobbles. Soil textures vary from silt loam to sand. Water tables average 30 cm (12 in) below the surface in mid-summer, but water depths of several stands were greater than one meter. Coarse textured soils, moderate stream gradients, and high coarse fragment contents throughout the soil profile provide an environment that produces a rapid movement of highly aerated groundwater. This type of substrate is important to many floodplain communities.

ADJACENT COMMUNITIES

Adjacent wetter communities are often dominated by *Carex atherodes* (awned sedge), *Scirpus acutus* (great bulrush), *Typha latifolia* (common cattail), *Salix bebbiana* (beaked willow), *Salix petiolaris* (basket willow), or occasionally *Populus balsamifera* (balsam poplar). Drier sites are uplands dominated by steppe vegetation.

MANAGEMENT INFORMATION

Livestock

This type is a valuable source of browse and forage for livestock and wildlife. Livestock use this type for shade and as bedding ground. However, persistent grazing and trampling have already caused compositional and structural changes. Conversion back to the original vegetation is unlikely to occur simply by altering the grazing regime.

Forage production ranges from low to moderate due to the dense shrub understory within the stands. Forage production from dense thickets of *Symphoricarpos occidentalis* (buckbrush) and *Rosa* species (rose) is low. Stands may be so dense that they preclude most livestock use. As the shrub understory is reduced by prolonged heavy utilization, the stands open and forage production actually increases due to the replacement by *Agropyron smithii* (western wheat grass), *Poa pratensis* (Kentucky bluegrass), *Phleum pratense* (timothy), and *Bromus inermis* (awnless brome). Palatability of *Symphoricarpos occidentalis* (buckbrush) ranges from low to fair for cattle and somewhat higher for sheep (Wasser 1982, Johnson and Nichols 1982, Harrison 2000), and the leaves of *Rosa woodsii* (common wild rose) are considered fair to fairly good livestock forage, particularly for sheep (Johnson and Nichols 1982).

Timber

Most timber harvest is salvage for fuelwood. Overwood removal will result in sprouting of young aspen from suckers. Stand development necessitates protection of young aspen from browsing.

Wildlife

The moderate structural understory diversity, primarily of *Symphoricarpos occidentalis* (buckbrush) and *Rosa woodsii* (common wild rose), does provide thermal and hiding cover for big game and upland bird species. Deer may use this type for early season forage. Beaver, if present, may make heavy use of *Populus tremuloides* (aspen) stands (Allen 1983). Wild ungulates browse young suckers and occasionally feed on the bark of older trees. Use by elk during spring, fall, and winter periods is often moderate to heavy (Kufeld 1973). *Populus tremuloides* (aspen) is highly preferred by moose (Costain 1989). The palatability of *Symphoricarpos occidentalis* (buckbrush) is rated as good for deer and elk (Wasser 1982, Johnson and Nichols 1982). Deer and elk may browse heavily on *Rosa woodsii* (common wild rose), while the persistent fruit (rose hips) provides fall and winter food for birds, small mammals, and bears, which disperse the seeds. *Rosa woodsii* (common wild rose) is strongly grazing tolerant but can be dwarfed and thinned by intense browsing or defoliation by season long use.

Use of this type as bedding grounds by wildlife is common. Birds such as redshafted flickers are common, and often nest in cavities of larger aspen. Understory species such as *Agropyron repens* (quack grass), *Rosa* species (rose), and *Symphoricarpos* species (buckbrush) provide food and cover for small mammals and birds, upland game and waterfowl (Dittberner and Olson 1983).

Fire

Populus tremuloides (aspen) responds to fire by producing large numbers of vigorous root suckers. However, livestock and large ungulates should be kept out of newly burned stands if successful regeneration is desired.

Soil Management and Rehabilitation Opportunities

Moist, fine textured soils are easily compacted and disturbed by livestock in spring and after rain events. Soil compaction is minimal on dry coarse textured soils.

Populus tremuloides (aspen) may be useful in revegetating disturbed sites having moist, well-drained soils. Best results are obtained using rooted cuttings or nursery-grown stock. Once established, growth rates are rapid. The quickly spreading roots of *Populus tremuloides* (aspen) effectively stabilize soils.

Recreational Uses and Considerations

If stands are extensive, this community type may provide good campground locations. Overstory aspen provide shade in an often otherwise treeless environment. However, successful aspen reproduction is likely to be reduced or eliminated by trampling. Fencing of selected areas to allow suckers to grow is recommended.

OTHER STUDIES

The *Populus tremuloides/Symphoricarpos occidentalis* (aspen/buckbrush) community type has not been described by others. A *Populus tremuloides/Symphoricarpos albus/Elymus glaucous* (aspen/snowberry/smooth wild rye) community type is described by Kovalchik (1987) in Oregon.

Salix amygdaloides Community Type

(Peach-leaved Willow Community Type)

SALIAMY

Number of Stands Sampled = 26

Number of Stands Sampled in Saskatchewan = 2

LOCATION AND ASSOCIATED LANDFORMS

The *Salix amygdaloides* (peach-leaved willow) community type is an incidental type at lower elevations in southern Saskatchewan. It occurs as a narrow band or irregularly shaped community in backwater areas, abandoned meander channels, overflow channels, and along pond and lake margins. It may also be found in V-shaped ravines (also called woody draws) where sites may be occasionally flooded by overland flows. In other cases, it occurs as small, isolated clumps immediately adjacent to streams and rivers of the region.

VEGETATION

The *Salix amygdaloides* (peach-leaved willow) community type consists of a tall shrub layer dominated by *Salix amygdaloides* (peach-leaved willow). Generally associated with this overstory are *Salix exigua* (sandbar willow), *Salix lutea* (yellow willow), and *Cornus stolonifera* (red-osier dogwood). The herbaceous understory is likely to include species such as *Poa palustris* (fowl bluegrass) and *Phalaris arundinacea* (reed canary grass) (Table 20).

Table 20. Average canopy cover, range of canopy cover, and constancy for species recorded in 6 stands of the *Salix amygdaloides* (peach-leaved willow) community type that are relatively undisturbed by livestock or wildlife

TABLE 20.	**% Can. Cov.**		
Species	**Avg.**	**Rng.**	**Con.**
Trees			
Fraxinus pennsylvanica (green ash)	3	0-3	17
Populus deltoides (plains cottonwood)	3	0-3	33
Shrubs			
Betula occidentalis (water birch)	3	0-3	17
Cornus stolonifera (red-osier dogwood)	16	0-40	67
Ribes aureum (golden currant)	1	0-1	17
Ribes oxyacanthoides (northern gooseberry)	3	0-3	17
Rosa woodsii (common wild rose)	3	0-3	17
Rosa spp. (rose)	15	0-30	33
Salix amygdaloides (peach-leaved willow)	55	40-60	100
Salix exigua (sandbar willow)	11	0-30	50
Salix lutea (yellow willow)	33	0-80	67
Shepherdia argentea (thorny buffaloberry)	10	0-10	17
Symphoricarpos occidentalis (buckbrush)	20	0-20	17
Graminoids			
Agropyron pectiniforme (crested wheat grass)	1	0-1	17
Agropyron repens (quack grass)	3	0-3	33
Agropyron smithii (western wheat grass)	60	0-60	17
Agrostis stolonifera (redtop)	3	0-3	50
Agropyron trachycaulum (slender wheat grass)	3	0-3	17
Bromus inermis (awnless brome)	3	0-3	33
Bromus tectorum (downy chess)	1	0-1	17
Carex lanuginosa (woolly sedge)	3	0-3	17
Elymus canadensis (Canada wild rye)	1	0-1	17
Hordeum jubatum (foxtail barley)	1	0-1	17
Phalaris arundinacea (reed canary grass)	24	0-60	50
Poa palustris (fowl bluegrass)	27	0-60	67
Poa pratensis (Kentucky bluegrass)	3	0-3	50
Forbs			
Spartina pectinata (prairie cord grass)	1	0-1	17
Apocynum cannabinum (Indian hemp)	15	0-20	33
Apocynum spp. (dogbane)	1	0-1	17
Artemisia absinthium (absinthe wormwood)	3	0-3	33
Aster brachyactis (rayless aster)	1	0-1	17

TABLE 20.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Aster spp. (aster)	20	0-20	17
Bidens cernua (nodding beggarticks)	3	0-3	17
Cicuta maculata (water-hemlock)	20	0-20	17
Cirsium arvense (Canada thistle)	5	0-10	50
Fragaria virginiana (wild strawberry)	1	0-1	17
Geranium spp. (geranium)	3	0-3	17
Glycyrrhiza lepidota (wild licorice)	60	0-60	17
Kochia scoparia (summer-cypress)	3	0-3	17
Lactuca serriola (prickly lettuce)	1	0-1	17
Lycopus asper (western water-horehound)	20	0-20	17
Melilotus alba (white sweet-clover)	40	0-40	17
Melilotus officinalis (yellow sweet-clover)	22	0-40	33
Mentha arvensis (wild mint)	7	0-20	50
Parietaria pensylvanica (American pellitory)	3	0-3	17
Petasites sagittatus (arrow-leaved coltsfoot)	1	0-1	17
Plantago major (common plantain)	1	0-1	17
Polygonum amphibium (water smartweed)	1	0-1	17
Potentilla anserina (silverweed)	1	0-1	17
Potentilla spp. (cinquefoil)	20	0-20	17
Sanicula marilandica (snakeroot)	1	0-1	17
Smilacina stellata (star-flowered Solomon's-seal)	7	0-10	33
Solidago canadensis (Canada goldenrod)	5	0-10	33
Sonchus asper (prickly annual sow-thistle)	3	0-3	17
Urtica dioica (common nettle)	3	0-3	17
Vicia americana (wild vetch)	1	0-1	33
Ferns and Allies			
Equisetum arvense (common horsetail)	22	0-40	33

SUCCESSIONAL INFORMATION

In most situations, the *Salix amygdaloides* (peach-leaved willow) community type represents a successional stage of a *Salix lutea/Cornus stolonifera* (yellow willow/red-osier dogwood) habitat type, or the *Acer negundo/Prunus virginiana* (Manitoba maple/choke cherry) habitat type or the *Fraxinus pennsylvanica/Prunus virginiana* (green ash/choke cherry) habitat type.

Disturbance Stages

Higher levels of disturbance tend to increase those disturbance-related species already present. If the disturbance includes trampling and/or rubbing by livestock, the weak, multi-stemmed nature of *Salix amygdaloides* (peach-leaved willow) will result in a great deal of downed woody material. This fallen woody material tends to restrict livestock use. Other sites may be wet enough to preclude most types of disturbances. (Table 21)

Table 21. Average canopy cover, range of canopy cover, and constancy for species recorded in 20 disturbed stands of the *Salix amygdaloides* (peach-leaved willow) community type

TABLE 21.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Trees			
Acer negundo (Manitoba maple)	3	0-3	5
Fraxinus pennsylvanica (green ash)	1	0-3	15
Populus angustifolia (narrow-leaf cottonwood)	3	0-3	10
Populus balsamifera (balsam poplar)	10	0-10	5
Populus deltoides (plains cottonwood)	3	0-3	10
Shrubs			
Amelanchier alnifolia (Saskatoon)	14	0-30	15
Artemisia cana (silver sagebrush)	10	0-10	5
Clematis ligusticifolia (western clematis)	12	0-20	10
Cornus stolonifera (red-osier dogwood)	23	0-40	20
Crataegus douglasii (Douglas hawthorn)	2	0-3	10
Rhus radicans (poison ivy)	1	0-1	5
Ribes americanum (wild black currant)	3	0-3	5
Ribes aureum (golden currant)	9	0-20	15

TABLE 21.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Ribes oxyacanthoides (northern gooseberry)	1	0-1	10
Ribes spp. (currant)	2	0-3	15
Rosa acicularis (prickly rose)	42	0-80	10
Rosa woodsii (common wild rose)	26	0-60	50
Rosa spp. (rose)	12	0-40	20
Rubus spp. (raspberry)	20	0-20	5
Salix amygdaloides (peach-leaved willow)	62	30-98	100
Salix bebbiana (beaked willow)	3	0-3	5
Salix exigua (sandbar willow)	16	0-80	50
Salix lucida (shining willow)	3	0-3	5
Salix lutea (yellow willow)	10	0-20	10
Shepherdia argentea (thorny buffaloberry)	3	0-3	5
Symphoricarpos albus (snowberry)	12	0-20	10
Symphoricarpos occidentalis (buckbrush)	15	0-20	50
Tamarix chinensis (salt cedar)	3	0-3	5
Vitis riparia (riverbank grape)	1	0-1	5
Graminoids			
Agropyron dasystachyum (northern wheat grass)	10	0-10	5
Agropyron elongatum (tall wheat grass)	20	0-20	5
Agropyron pectiniforme (crested wheat grass)	20	0-20	5
Agropyron repens (quack grass)	17	0-30	25
Agropyron smithii (western wheat grass)	20	0-30	10
Agrostis stolonifera (redtop)	27	0-60	25
Agropyron trachycaulum (slender wheat grass)	2	0-3	10
Bromus inermis (awnless brome)	46	0-80	45
Bromus japonicus (Japanese chess)	1	0-1	5
Carex douglasii (Douglas sedge)	1	0-1	5
Carex lanuginosa (woolly sedge)	7	0-20	20
Carex nebraskensis (Nebraska sedge)	20	0-20	5
Carex rostrata (beaked sedge)	20	0-20	5
Eleocharis palustris (creeping spike-rush)	5	0-10	10
Elymus canadensis (Canada wild rye)	10	0-20	10
Elymus piperi (giant wild rye)	10	0-10	5
Elymus virginicus (Virginia wild rye)	3	0-3	5
Hordeum jubatum (foxtail barley)	3	0-10	20
Juncus balticus (wire rush)	12	0-20	10
Muhlenbergia racemosa (marsh muhly)	2	0-3	10
Phalaris arundinacea (reed canary grass)	5	0-10	15
Phleum pratense (timothy)	10	0-10	5
Poa compressa (Canada bluegrass)	1	0-1	5
Poa palustris (fowl bluegrass)	8	0-20	30
Poa pratensis (Kentucky bluegrass)	35	0-80	55
Scirpus paludosus (prairie bulrush)	1	0-1	5
Scirpus pungens (three-square rush)	2	0-3	10
Spartina pectinata (prairie cord grass)	30	0-60	10
Stipa columbiana (Columbia needle grass)	1	0-1	5
Forbs			
Ambrosia trifida (great ragweed)	10	0-10	5
Arctium spp. (burdock)	1	0-1	5
Artemisia dracunculus (dragonwort)	1	0-1	5
Asclepias speciosa (showy milkweed)	1	0-1	5
Asparagus officinalis (asparagus)	3	0-3	5
Aster ericoides (tufted white prairie aster)	2	0-3	10
Aster hesperius (western willow aster)	3	0-3	10
Aster spp. (aster)	3	0-3	10
Chenopodium fremontii (Fremont's goosefoot)	3	0-3	5
Cirsium arvense (Canada thistle)	15	0-60	60
Cynoglossum officinale (hound's-tongue)	3	0-3	5
Galium triflorum (sweet-scented bedstraw)	3	0-3	5
Geum macrophyllum (large-leaved yellow avens)	2	0-3	10
Glycyrrhiza lepidota (wild licorice)	14	0-60	35
Grindelia squarrosa (gumweed)	1	0-1	5
Lactuca serriola (prickly lettuce)	1	0-3	20
Lycopus asper (western water-horehound)	3	0-3	5
Medicago lupulina (black medick)	1	0-1	5
Medicago sativa (alfalfa)	1	0-1	5
Melilotus alba (white sweet-clover)	21	0-60	15
Melilotus officinalis (yellow sweet-clover)	30	0-60	10

TABLE 21.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Mentha arvensis (wild mint)	1	0-1	15
Monarda fistulosa (wild bergamot)	1	0-1	5
Polygonum amphibium (water smartweed)	11	0-20	15
Polygonum arenastrum (common knotweed)	1	0-1	5
Potentilla anserina (silverweed)	3	0-3	5
Rudbeckia hirta (black-eyed Susan)	1	0-1	5
Rumex crispus (curled dock)	5	0-10	15
Sisymbrium loeselii (tall hedge mustard)	1	0-1	5
Smilacina stellata (star-flowered Solomon's-seal)	1	0-1	10
Solanum dulcamara (creeping nightshade)	1	0-1	5
Solidago canadensis (Canada goldenrod)	1	0-1	5
Solidago spp. (goldenrod)	1	0-1	5
Solidago missouriensis (low goldenrod)	3	0-3	10
Sonchus asper (prickly annual sow-thistle)	2	0-3	10
Taraxacum officinale (common dandelion)	1	0-3	25
Thlaspi arvense (stinkweed)	1	0-1	5
Trautvetteria caroliniensis (false bugbane)	1	0-1	5
Trifolium repens (white clover)	3	0-3	5
Typha latifolia (common cattail)	1	0-1	5
Urtica dioica (common nettle)	9	0-30	20
Vicia americana (wild vetch)	3	0-3	5
Xanthium strumarium (cocklebur)	1	0-1	15
Ferns and Allies			
Equisetum arvense (common horsetail)	3	0-3	5
Equisetum laevigatum (smooth scouring-rush)	10	0-10	5

SOILS

Soils are commonly Regosols or Chernozems. This community type occurs on a wide range of soil textures except heavy clay. Water tables are usually within 1 m (39 in) of the soil surface throughout the growing season. *Salix amygdaloides* (peach-leaved willow) can tolerate weakly saline and alkaline soils, poor soil drainage, and prolonged flooding.

ADJACENT COMMUNITIES

Wetter sites may be *Typha latifolia* (common cattail), *Scirpus* species (bulrush), *Eleocharis* species (spike-rush), *Spartina pectinata* (prairie cord grass), or *Phalaris arundinacea* (reed canary grass) habitat types. Adjacent drier sites may be dominated by the *Acer negundo/Prunus virginiana* (Manitoba maple/choke cherry) habitat type, the *Artemisia cana/Agropyron smithii* (silver sagebrush/western wheat grass) habitat type, or the *Fraxinus pennsylvanica/Prunus virginiana* (green ash/choke cherry) habitat type. In other situations, drier sites may be the *Rosa woodsii* (common wild rose), *Symphoricarpos occidentalis* (buckbrush), or the *Shepherdia argentea* (thorny buffaloberry) community types.

MANAGEMENT INFORMATION

Livestock

Wet conditions associated with *Salix amygdaloides* (peach-leaved willow) stands generally limit livestock use. However, during wet periods livestock use can lead to the churning of soil or soil compaction.

Wildlife

The high degree of structural diversity in the *Salix amygdaloides* (peach-leaved willow) community type provides excellent thermal and hiding cover for wildlife.

Fisheries

The *Salix amygdaloides* (peach-leaved willow) community type provides limited thermal cover for fish. However, it is an effective stabilizer of streambanks and managers should attempt to protect them.

Fire

Most fires kill only aboveground plant parts of *Salix amygdaloides* (peach-leaved willow). However, severe fires can completely remove soil organic layers, leaving roots exposed and charred, and thus eliminating basal sprouting. Generally, *Salix amygdaloides* (peach-leaved willow) will resprout from its roots following fire, but the species is a prolific seeder, and off-site plants are important seed sources for revegetating burned areas. Due to their proximity to water or high water tables, *Salix amygdaloides* (peach-leaved willow) communities may serve as natural fire breaks (USDA IFSL 1995).

Soil Management and Rehabilitation Opportunities

High water tables and seasonal flooding should limit activities and development in most of these stands. Care must be taken in the placement of roads and other developments in sites of this type.

Recreational Uses and Considerations

The *Salix amygdaloides* (peach-leaved willow) community type provides excellent opportunities for viewing wildlife species. However, the dense nature of most healthy stands and the high water tables associated with them tend to make access difficult.

OTHER STUDIES

The *Salix amygdaloides* (peach-leaved willow) community type is described by Hansen and others (1995) for Montana.

Salix bebbiana/Carex atherodes Habitat Type (Beaked willow/Awned Sedge Habitat Type)

SALIBEB/CAREATH
Number of Stands Sampled = 14
Number of Stands Sampled in Saskatchewan = 2

LOCATION AND ASSOCIATED LANDFORMS

The *Salix bebbiana/Carex atherodes* (beaked willow/awned sedge) habit type is a minor type throughout the Moist Mixed Grass Ecoregion, the Mixed Grass Ecoregion, and the Aspen Parkland Ecoregion. It may also occur incidentally in the Cypress Upland Ecoregion. It occupies alluvial terraces and moist to wet areas near springs, seeps, and subirrigated meadows.

VEGETATION

The *Salix bebbiana/Carex atherodes* (beaked willow/awned sedge) habitat type is a climax community dominated by *Salix bebbiana* (beaked willow) in the tallest layer and *Carex atherodes* (awned sedge) or *Carex rostrata* (beaked sedge) in a very moist herbaceous understory. Other shrubs often present are *Cornus stolonifera* (red-osier dogwood), other *Salix* (willow) species, *Rosa* species (rose), and *Symphoricarpos* species (buckbrush) (Table 22).

Table 22. Average canopy cover, range of canopy cover, and constancy for species recorded in 6 late seral to climax stands of the *Salix bebbiana/Carex atherodes* (beaked willow/awned sedge) habitat type

TABLE 22.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Trees			
Picea glauca (white spruce)	1	0-1	17
Populus balsamifera (balsam poplar)	1	0-1	17
Shrubs			
Betula glandulosa (bog birch)	3	0-3	17
Betula occidentalis (water birch)	1	0-1	17
Cornus stolonifera (red-osier dogwood)	2	0-3	33
Ribes lacustre (bristly black currant)	1	0-1	17
Ribes oxyacanthoides (northern gooseberry)	1	0-1	17
Rosa spp. (rose)	1	0-3	50
Salix bebbiana (beaked willow)	53	20-80	100
Salix drummondiana (Drummond's willow)	3	0-3	17
Salix lutea (yellow willow)	3	0-3	17
Salix maccalliana (velvet-fruited willow)	1	0-1	17
Salix myrtillifolia (myrtle-leaved willow)	12	0-20	33
Salix petiolaris (basket willow)	17	0-30	33
Salix planifolia (flat-leaved willow)	3	0-3	33
Salix pseudomonticola (false mountain willow)	1	0-1	17
Symphoricarpos occidentalis (buckbrush)	2	0-3	33
Graminoids			
Agropyron smithii (western wheat grass)	1	0-1	17
Alopecurus occidentalis (alpine foxtail)	3	0-3	17
Bromus inermis (awnless brome)	20	0-20	33
Calamagrostis canadensis (bluejoint)	10	0-10	33
Carex aquatilis (water sedge)	10	0-10	17
Carex atherodes (awned sedge)	33	0-80	83
Carex lanuginosa (woolly sedge)	3	0-3	17
Carex norvegica (Norway sedge)	10	0-10	17
Carex rostrata (beaked sedge)	35	0-60	33
Juncus balticus (wire rush)	20	0-20	17
Poa palustris (fowl bluegrass)	1	0-1	17
Poa pratensis (Kentucky bluegrass)	3	0-3	17
Scirpus microcarpus (small-fruited bulrush)	1	0-1	17
Forbs			
Angelica arguta (white angelica)	3	0-3	17
Aster borealis (marsh aster)	1	0-1	17
Aster laevis (smooth aster)	10	0-10	17
Cicuta maculata (water-hemlock)	1	0-1	17
Cirsium arvense (Canada thistle)	1	0-1	33
Epilobium angustifolium (common fireweed)	1	0-1	17
Fragaria vesca (woodland strawberry)	1	0-1	17
Fragaria virginiana (wild strawberry)	1	0-1	17
Galium boreale (northern bedstraw)	1	0-1	17
Geum aleppicum (yellow avens)	10	0-10	17
Geum macrophyllum (large-leaved yellow avens)	3	0-3	17
Heracleum lanatum (cow parsnip)	1	0-1	17
Mentha arvensis (wild mint)	3	0-3	33
Mertensia paniculata (tall lungwort)	3	0-3	17
Mitella nuda (bishop's-cap)	3	0-3	17
Pedicularis bracteosa (western lousewort)	1	0-1	17
Pedicularis groenlandica (elephant's-head)	1	0-1	17
Petasites sagittatus (arrow-leaved coltsfoot)	3	0-3	17
Polygonum amphibium (water smartweed)	20	0-20	17
Polygonum convolvulus (wild buckwheat)	1	0-1	17
Potentilla gracilis (graceful cinquefoil)	1	0-1	17
Rumex occidentalis (western dock)	1	0-1	17
Sanicula marilandica (snakeroot)	1	0-1	17
Smilacina stellata (star-flowered Solomon's-seal)	5	0-10	33
Solidago canadensis (Canada goldenrod)	10	0-10	17
Solidago rigida (stiff goldenrod)	1	0-1	17
Sonchus arvensis (perennial sow-thistle)	1	0-1	17
Sonchus spp. (sow-thistle)	3	0-3	17
Spiranthes romanzoffiana (hooded ladies'-tresses)	1	0-1	17
Taraxacum officinale (common dandelion)	3	0-3	17

TABLE 22.	% Can. Cov.		
Species	Avg.	Rng.	Con.
Thalictrum occidentale (western meadow rue)	3	0-3	17
Vicia americana (wild vetch)	1	0-1	50
Viola spp. (violet)	3	0-3	17
Ferns and Allies			
Equisetum arvense (common horsetail)	18	0-40	50
Equisetum fluviatile (swamp horsetail)	10	0-10	17

SUCCESSIONAL INFORMATION

Sites with potential for *Salix bebbiana/Carex atherodes* (beaked willow/awned sedge) habitat type are most often colonized by *Salix bebbiana* (beaked willow), but may initially have other willow species present. With prolonged moderate to heavy grazing pressure, the *Salix bebbiana* (beaked willow) will lose its *Carex* (sedge) understory to a more diverse set of disturbance-increasers such as *Smilacina stellata* (star-flowered Solomon's-seal), *Solidago canadensis* (Canada goldenrod), *Agrostis stolonifera* (redtop), *Phleum pratense* (timothy), and *Equisetum arvense* (common horsetail) (Table 23). This disturbance has the effect of drying out the site and results in the grazing disclimax *Salix bebbiana* (beaked willow) community type.

Salix bebbiana (beaked willow) is a highly palatable willow to browsing animals. However, this does not seem to negatively affect the status of *Salix bebbiana* (beaked willow) on a site. In fact, *Salix bebbiana* (beaked willow) seems to have evolved a tolerance to the browsing and can remain on a site under all but the most severe long-term browsing. This tolerance to browsing allows *Salix bebbiana* (beaked willow) to increase at the expense of less tolerant willow species and other desirable shrubs, such as *Cornus stolonifera* (red-osier dogwood). On severely degraded sites with prolonged levels of browsing, *Salix bebbiana* (beaked willow) is typically the last willow species to remain on the site. The degree of dominance of the undergrowth by introduced herbaceous species can be used to indicate the extent of disturbance.

Table 23. Average canopy cover, range of canopy cover, and constancy for species recorded in 8 early seral or disturbed stands of the *Salix bebbiana/Carex atherodes* (beaked willow/awned sedge) habitat type

TABLE 23.	% Can. Cov.		
Species	Avg.	Rng.	Con.
Shrubs			
Betula papyrifera (white birch)	1	0-1	13
Larix laricina (tamarack)	1	0-1	13
Picea glauca (white spruce)	1	0-1	13
Populus tremuloides (aspen)	1	0-1	13
Graminoids			
Betula glandulosa (bog birch)	10	0-10	13
Betula occidentalis (water birch)	1	0-1	13
Cornus stolonifera (red-osier dogwood)	2	0-3	25
Elaeagnus commutata (silverberry)	1	0-1	13
Lonicera dioica (twining honeysuckle)	1	0-1	13
Potentilla fruticosa (shrubby cinquefoil)	3	0-3	13
Ribes inerme (mountain gooseberry)	1	0-1	13
Ribes oxyacanthoides (northern gooseberry)	1	0-1	25
Ribes spp. (currant)	1	0-1	13
Rosa woodsii (common wild rose)	20	0-20	13
Rosa spp. (rose)	1	0-1	25
Rubus arcticus (dwarf raspberry)	1	0-1	13
Rubus idaeus (wild red raspberry)	1	0-1	13
Salix bebbiana (beaked willow)	49	10-80	100
Salix boothii (Booth's willow)	10	0-10	13
Salix candida (hoary willow)	1	0-1	13
Salix lutea (yellow willow)	7	0-10	25
Salix petiolaris (basket willow)	20	0-20	25
Salix planifolia (flat-leaved willow)	1	0-1	13
Salix pseudomonticola (false mountain willow)	2	0-3	25
Salix serissima (autumn willow)	7	0-10	25
Symphoricarpos occidentalis (buckbrush)	10	0-20	25
Agrostis spp. (Agrostis)	1	0-1	13

TABLE 23.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Agrostis stolonifera (redtop)	13	0-20	50
Agropyron trachycaulum (slender wheat grass)	5	0-10	25
Alopecurus occidentalis (alpine foxtail)	3	0-3	13
Alopecurus pratensis (meadow foxtail)	10	0-10	13
Beckmannia syzigachne (slough grass)	10	0-20	25
Bromus inermis (awnless brome)	10	0-20	25
Calamagrostis stricta (narrow reed grass)	10	0-10	13
Carex aquatilis (water sedge)	5	0-10	25
Carex atherodes (awned sedge)	21	0-40	38
Carex lanuginosa (woolly sedge)	2	0-3	25
Carex praegracilis (graceful sedge)	1	0-1	13
Carex rostrata (beaked sedge)	23	0-60	75
Carex spp. (sedge)	1	0-1	13
Deschampsia cespitosa (tufted hair grass)	1	0-1	13
Festuca saximontana (Rocky Mountain fescue)	1	0-1	13
Glyceria grandis (common tall manna grass)	40	0-40	13
Glyceria striata (fowl manna grass)	10	0-10	13
Hordeum jubatum (foxtail barley)	1	0-1	25
Juncus balticus (wire rush)	15	0-40	50
Phalaris arundinacea (reed canary grass)	20	0-20	13
Phleum pratense (timothy)	8	0-20	50
Poa interior (inland bluegrass)	1	0-1	13
Poa palustris (fowl bluegrass)	5	0-10	38
Poa pratensis (Kentucky bluegrass)	3	0-3	25
Scirpus microcarpus (small-fruited bulrush)	1	0-1	25
Forbs			
Achillea millefolium (common yarrow)	1	0-1	38
Achillea ptarmica (sneezewort yarrow)	3	0-3	13
Actaea rubra (red and white baneberry)	1	0-1	13
Anemone cylindrica (long-fruited anemone)	1	0-1	13
Angelica arguta (white angelica)	18	0-40	38
Aster ascendens (western aster)	20	0-20	13
Aster borealis (marsh aster)	1	0-1	13
Aster conspicuus (showy aster)	3	0-3	13
Aster eatonii (Eaton's aster)	3	0-3	13
Aster laevis (smooth aster)	1	0-1	13
Aster modestus (large northern aster)	10	0-10	13
Chrysanthemum leucanthemum (ox-eye daisy)	1	0-1	13
Cicuta maculata (water-hemlock)	12	0-20	25
Cirsium arvense (Canada thistle)	5	0-10	25
Epilobium ciliatum (northern willowherb)	3	0-3	13
Erigeron philadelphicus (Philadelphia fleabane)	3	0-3	13
Fragaria vesca (woodland strawberry)	1	0-1	13
Fragaria virginiana (wild strawberry)	1	0-1	25
Galium boreale (northern bedstraw)	1	0-1	25
Galium trifidum (small bedstraw)	1	0-1	13
Geranium richardsonii (wild white geranium)	3	0-3	25
Geum aleppicum (yellow avens)	1	0-1	13
Geum macrophyllum (large-leaved yellow avens)	3	0-10	63
Habenaria spp. (bog orchid)	1	0-1	13
Heracleum lanatum (cow parsnip)	11	0-20	38
Lysimachia ciliata (fringed loosestrife)	2	0-3	25
Medicago lupulina (black medick)	1	0-1	13
Mentha arvensis (wild mint)	10	0-40	63
Mertensia paniculata (tall lungwort)	1	0-1	13
Mimulus guttatus (yellow monkeyflower)	20	0-20	13
Monarda fistulosa (wild bergamot)	3	0-3	13
Parnassia palustris (northern grass-of-parnassus)	1	0-1	13
Petasites sagittatus (arrow-leaved coltsfoot)	10	0-20	38
Polygonum coccineum (water smartweed)	3	0-3	13
Potentilla anserina (silverweed)	1	0-1	13
Potentilla norvegica (rough cinquefoil)	1	0-1	13
Pyrola asarifolia (common pink wintergreen)	1	0-1	13
Ranunculus acris (tall buttercup)	10	0-10	13
Rumex occidentalis (western dock)	1	0-1	13
Rumex spp. (dock; sorrel)	1	0-1	13
Senecio pauperculus (balsam groundsel)	1	0-1	13

TABLE 23.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Senecio triangularis (brook ragwort)	3	0-3	13
Smilacina stellata (star-flowered Solomon's-seal)	1	0-1	25
Solidago canadensis (Canada goldenrod)	22	0-40	25
Solidago missouriensis (low goldenrod)	1	0-1	13
Stachys palustris (marsh hedge-nettle)	1	0-1	13
Stellaria calycantha (northern stitchwort)	1	0-1	13
Taraxacum officinale (common dandelion)	4	0-10	38
Thalictrum venulosum (veiny meadow rue)	1	0-1	25
Trifolium repens (white clover)	10	0-10	13
Urtica dioica (common nettle)	1	0-1	13
Vicia americana (wild vetch)	2	0-3	50
Viola spp. (violet)	3	0-3	13
Viola palustris (marsh violet)	1	0-1	13
Viola renifolia (kidney-leaved violet)	20	0-20	13
Ferns and Allies			
Equisetum arvense (common horsetail)	21	0-80	63
Equisetum fluviatile (swamp horsetail)	1	0-1	13

SOILS

Soils are commonly dark brown to black Chernozems, but can intergrade to soils of the Organic order under conditions favorable for organic matter accumulation. Soil texture varies little from clay loam to sandy loam. Water tables are usually within 1 m (39 in) of the soil surface throughout summer. Redoximorphic features (mottles or gleyed soil) are also common within 1 m (39 in) of the soil surface. Estimated available water ranges from low to high.

ADJACENT COMMUNITIES

Adjacent wetter types can include the *Carex atherodes* (awned sedge) habitat type and the *Salix petiolaris/Carex atherodes* (basket willow/awned sedge) habitat type. Drier sites may support such types as the *Populus tremuloides/Cornus stolonifera* (aspen/red-osier dogwood) habitat type, *Prunus virginiana* (choke cherry) or *Bromus inermis* (awnless brome) community types, or upland species.

MANAGEMENT INFORMATION

Livestock

Stands of the *Salix bebbiana/Carex atherodes* (beaked willow/awned sedge) habitat type are often populated by widely spaced shrubs, allowing for easy livestock access. Forage production is moderate to high, and as a result, heavy use by livestock is common. The moist, fine textured soils are extremely susceptible to trampling damage, becoming compacted and hummocked with prolonged presence of livestock. In some stands, the willows may have a reduced vigour, indicated by highlining, clubbing, or decadent clumps. With continued overuse, willows can show a sharp decline in vigour, and they may eventually be eliminated from the site.

Frisina (1991) states that for a grazing program to be successful, it must meet the basic biological requirements of the plants present. These are photosynthesis, food storage, reproduction, and seedling establishment. In order to meet these requirements, long periods of rest are needed. It is during the long growing season rest periods that these essential biological processes of food production and storage, reproduction, and seedling establishment occur. In some instances, additional periods of rest may be required to improve or maintain a plant community.

Wildlife

Where the *Salix bebbiana/Carex atherodes* (beaked willow/awned sedge) habitat type occurs on winter game ranges, browsing of *Salix bebbiana* (beaked willow) by wild ungulates is often high enough to reduce plant vigour and regeneration. Gaffney (1941) reported that *Salix bebbiana* (beaked willow) is a highly valuable browse for elk, with heavy utilization common. Continued use may lead to conversion to an herbaceous community such as the *Poa palustris* (fowl bluegrass) and *Poa pratensis* (Kentucky bluegrass) community types. Moose and beaver also heavily utilize most species of willow.

Fisheries

The importance of willows in streambank stabilization, cover, and thermal protection for fisheries cannot be over emphasized. The herbaceous understory aids in filtering out sediments during overbank flows, thereby contributing to streambank building.

Fire

Salix bebbiana (beaked willow) sprouts rapidly following fire (Haeussler and Coates 1986). Quick, hot fires maximize sprouting, while slower burns cause more damage to plants. Prescribed burning is a commonly used wildlife management tool to rejuvenate decadent communities dominated by *Salix bebbiana* (beaked willow). The light seeds readily colonize exposed mineral soil after hot fires. The degree to which this species invades after fire, however, depends on the time of year, weather, and presence of a mineral seedbed. The chance of beaked willow establishing after a fire lessens, as available mineral soil seedbeds become occupied by faster growing herbaceous species and mosses. Prescribed burning is a common wildlife management tool used to rejuvenate decadent beaked willow communities (USDA IFSL 1995).

Soil Management and Rehabilitation Opportunities

The *Salix bebbiana/Carex atherodes* (beaked willow/awned sedge) habitat type receives high use by wildlife and cattle. Soils and streambanks are highly susceptible to trampling damage, especially when soils are fine textured or wet. Deferring grazing until sites are drier can reduce trampling and compaction problems (Marlow 1984). Unless the high water tables are maintained, the understories in these stands will be converted to dominance by introduced grass species and weedy forbs.

Salix bebbiana (beaked willow) is valuable for revegetating streambanks. Cuttings are best taken in the spring, from dormant two to four year old wood. Cuttings 30-50 cm (12-20 in) long and more than 1 cm (0.5 in) in diameter produce the best results, with the cuttings rooting freely along the entire length of the stem. Shoots from cuttings can be expected to appear 10-20 days after planting. However, use of rooted cuttings and nursery grown stock will produce better results.

OTHER STUDIES

The *Salix bebbiana/Carex atherodes* (beaked willow/awned sedge) habitat type has not been described by others. A similar *Salix bebbiana*/mesic graminoid (beaked willow/mesic graminoid) community type has been identified by Padgett and others (1989) in Utah, with an undergrowth dominated by *Poa pratensis* (Kentucky bluegrass) and other mesic grasses. Chadde and others (1988) defined a *Salix bebbiana/Agrostis stolonifera* (beaked willow/redtop) community type for northern Yellowstone National Park. A *Salix bebbiana* (beaked willow) community is described by Lawrence and Romo (1994) on the Matador Research Station in southern Saskatchewan.

Salix bebbiana/Cornus stolonifera Habitat Type
(Beaked Willow/Red-osier Dogwood Habitat Type)

SALIBEB/CORNSTO

Number of Stands Sampled = 25

Number of Stands Sampled in Saskatchewan = 12

LOCATION AND ASSOCIATED LANDFORMS

The *Salix bebbiana/Cornus stolonifera* (beaked willow/red-osier dogwood) habitat type is a minor type in the Moist Mixed Grass Ecoregion and the Mixed Grass Ecoregion. In the southwestern, drier portion of the Mixed Grass Ecoregion south of the Cypress Hills, this type yields to the *Salix lutea/Cornus stolonifera* (yellow willow/red-osier dogwood) habitat type on lotic (stream floodplain) systems.

VEGETATION

The *Salix bebbiana/Cornus stolonifera* (beaked willow/red-osier dogwood) habitat type is a climax community dominated by *Salix bebbiana* (beaked willow) in the tallest layer and *Cornus stolonifera* (red-osier dogwood) in a moist, tall shrub understory (Table 24).

Table 24. Average canopy cover, range of canopy cover, and constancy for species recorded in 10 late seral to climax stands of the *Salix bebbiana/Cornus stolonifera* (beaked willow/red-osier dogwood) habitat type

TABLE 24.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Trees			
Acer negundo (Manitoba maple)	1	0-1	10
Betula papyrifera (white birch)	10	0-10	10
Populus tremuloides (aspen)	1	0-3	30
Shrubs			
Amelanchier alnifolia (Saskatoon)	5	0-10	30
Cornus stolonifera (red-osier dogwood)	33	10-70	100
Elaeagnus commutata (silverberry)	2	0-3	20
Potentilla fruticosa (shrubby cinquefoil)	1	0-1	10
Prunus virginiana (choke cherry)	3	0-3	20
Ribes americanum (wild black currant)	2	0-3	20
Ribes hudsonianum (northern black currant)	3	0-3	10
Ribes lacustre (bristly black currant)	3	0-3	10
Ribes oxyacanthoides (northern gooseberry)	4	0-10	30
Ribes spp. (currant)	1	0-1	10
Ribes viscosissimum (sticky currant)	1	0-1	10
Rosa spp. (rose)	8	0-20	70
Rubus idaeus (wild red raspberry)	2	0-3	20
Rubus pubescens (dewberry)	3	0-3	10
Salix bebbiana (beaked willow)	61	30-90	100
Salix exigua (sandbar willow)	3	0-3	10
Salix petiolaris (basket willow)	10	0-10	10
Salix pseudomonticola (false mountain willow)	30	0-30	10
Shepherdia canadensis (Canada buffaloberry)	1	0-1	10
Symphoricarpos spp. (buckbrush)	5	0-10	20
Symphoricarpos occidentalis (buckbrush)	7	0-20	50
Graminoids			
Agropyron repens (quack grass)	3	0-3	10
Agrostis stolonifera (redtop)	8	0-20	40
Beckmannia syzigachne (slough grass)	3	0-3	10
Bromus inermis (awnless brome)	6	0-10	50
Calamagrostis canadensis (bluejoint)	12	0-20	20
Carex atherodes (awned sedge)	25	0-30	20
Carex bebbii (Bebb's sedge)	10	0-10	10
Carex lanuginosa (woolly sedge)	1	0-1	10
Carex microglochin (short-awned sedge)	1	0-1	10
Carex petasata (pasture sedge)	3	0-3	10
Carex praegracilis (graceful sedge)	3	0-3	10
Carex praticola (meadow sedge)	3	0-3	10
Carex rostrata (beaked sedge)	3	0-3	10
Carex sartwellii (Sartwell's sedge)	3	0-3	10
Carex sprengelii (Sprengel's sedge)	1	0-1	10
Elymus glaucus (smooth wild rye)	1	0-1	10
Glyceria grandis (common tall manna grass)	20	0-20	10

TABLE 24.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Glyceria striata (fowl manna grass)	10	0-10	10
Phalaris arundinacea (reed canary grass)	23	0-30	30
Phleum pratense (timothy)	5	0-10	30
Poa palustris (fowl bluegrass)	4	0-10	30
Poa pratensis (Kentucky bluegrass)	5	0-10	60
Forbs			
Achillea millefolium (common yarrow)	1	0-1	20
Achillea sibirica (many-flowered yarrow)	1	0-1	10
Actaea rubra (red and white baneberry)	1	0-1	20
Agastache spp. (giant-hyssop)	3	0-3	10
Anemone canadensis (Canada anemone)	3	0-3	10
Anemone cylindrica (long-fruited anemone)	3	0-3	10
Artemisia absinthium (absinthe wormwood)	3	0-3	10
Aster ascendens (western aster)	1	0-1	10
Aster ciliolatus (Lindley's aster)	10	0-10	10
Aster conspicuus (showy aster)	3	0-3	10
Aster eatonii (Eaton's aster)	3	0-3	10
Aster ericoides (tufted white prairie aster)	3	0-3	10
Aster laevis (smooth aster)	2	0-3	20
Aster subspicatus (leafy-bracted aster)	1	0-1	10
Castilleja spp. (paintbrush)	1	0-1	10
Cicuta maculata (water-hemlock)	7	0-10	20
Cirsium arvense (Canada thistle)	1	0-3	30
Cirsium spp. (thistle)	1	0-1	10
Epilobium angustifolium (common fireweed)	7	0-10	30
Epilobium ciliatum (northern willowherb)	1	0-1	10
Erigeron philadelphicus (Philadelphia fleabane)	1	0-1	10
Unknown Forb	1	0-3	30
Fragaria virginiana (wild strawberry)	1	0-3	50
Galium boreale (northern bedstraw)	2	0-3	40
Galium triflorum (sweet-scented bedstraw)	1	0-1	20
Geranium richardsonii (wild white geranium)	2	0-3	40
Geranium viscosissimum (sticky purple geranium)	1	0-1	10
Geum macrophyllum (large-leaved yellow avens)	2	0-3	30
Heracleum lanatum (cow parsnip)	1	0-1	10
Lactuca pulchella (common blue lettuce)	1	0-1	10
Lathyrus ochroleucus (cream-colored vetchling)	1	0-1	20
Lysimachia ciliata (fringed loosestrife)	1	0-1	10
Mentha arvensis (wild mint)	5	0-10	30
Mertensia paniculata (tall lungwort)	1	0-1	10
Moehringia lateriflora (blunt-leaved sandwort)	1	0-1	10
Osmorhiza depauperata (spreading sweet cicely)	3	0-3	10
Osmorhiza spp. (sweet cicely)	1	0-1	10
Polygonum amphibium (water smartweed)	1	0-1	10
Potentilla gracilis (graceful cinquefoil)	1	0-1	10
Pyrola asarifolia (common pink wintergreen)	3	0-3	10
Ranunculus macounii (Macoun's buttercup)	1	0-1	10
Rorippa palustris (marsh yellow cress)	1	0-1	10
Rumex crispus (curled dock)	1	0-1	10
Sanicula marilandica (snakeroot)	1	0-1	10
Scutellaria galericulata (marsh skullcap)	1	0-1	10
Smilacina stellata (star-flowered Solomon's-seal)	3	0-10	70
Solidago canadensis (Canada goldenrod)	5	0-10	30
Solidago graminifolia (flat-topped goldenrod)	1	0-1	10
Solidago missouriensis (low goldenrod)	30	0-40	20
Sonchus arvensis (perennial sow-thistle)	3	0-3	10
Stachys palustris (marsh hedge-nettle)	7	0-10	30
Stellaria longipes (long-stalked chickweed)	1	0-1	10
Taraxacum officinale (common dandelion)	1	0-3	50
Thalictrum dasycarpum (tall meadow rue)	1	0-1	10
Thalictrum occidentale (western meadow rue)	10	0-10	10

TABLE 24.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Thalictrum venulosum (veiny meadow rue)	8	0-10	30
Trifolium spp. (clover)	3	0-3	10
Trifolium repens (white clover)	1	0-1	10
Urtica dioica (common nettle)	2	0-3	40
Vicia americana (wild vetch)	1	0-3	60
Viola spp. (violet)	1	0-1	10
Viola canadensis (western Canada violet)	8	0-20	30
Ferns and Allies			
Equisetum arvense (common horsetail)	7	0-20	60

SUCCESSIONAL INFORMATION

Sites with potential for the *Salix bebbiana/Cornus stolonifera* (beaked willow/red-osier dogwood) habitat type are most often colonized by *Salix bebbiana* (beaked willow), but may initially have other willow species present. With prolonged moderate to heavy grazing pressure, the *Salix bebbiana/Cornus stolonifera* (beaked willow/red-osier dogwood) habitat type will lose its tall/moist shrub understory to a more diverse set of shorter/drier shrub species and disturbance-increaser herbaceous species such as *Poa pratensis* (Kentucky bluegrass), *Phleum pratense* (timothy), and *Cirsium* arvense (Canada thistle) (Table 25). This disturbance has the effect of drying out the site and results in the grazing disclimax *Salix bebbiana* (beaked willow) community type.

Table 25. Average canopy cover, range of canopy cover, and constancy for species recorded in 15 early seral or disturbed stands of the *Salix bebbiana/Cornus stolonifera* (beaked willow/red-osier dogwood) habitat type

TABLE 25.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Trees			
Populus balsamifera (balsam poplar)	1	0-1	7
Populus tremuloides (aspen)	1	0-1	7
Shrubs			
Amelanchier alnifolia (Saskatoon)	3	0-3	7
Betula occidentalis (water birch)	1	0-1	13
Cornus stolonifera (red-osier dogwood)	21	3-40	100
Elaeagnus commutata (silverberry)	2	0-3	13
Juniperus horizontalis (creeping juniper)	60	0-60	7
Potentilla fruticosa (shrubby cinquefoil)	2	0-3	13
Prunus virginiana (choke cherry)	2	0-3	13
Rhus radicans (poison ivy)	3	0-3	7
Ribes americanum (wild black currant)	3	0-3	13
Ribes oxyacanthoides (northern gooseberry)	2	0-3	27
Ribes spp. (currant)	1	0-1	7
Rosa woodsii (common wild rose)	3	0-3	13
Rosa spp. (rose)	7	0-20	67
Rubus idaeus (wild red raspberry)	5	0-10	27
Rubus pubescens (dewberry)	1	0-1	7
Salix bebbiana (beaked willow)	60	10-90	100
Salix candida (hoary willow)	1	0-1	7
Salix exigua (sandbar willow)	7	0-10	13
Salix lutea (yellow willow)	20	0-20	7
Salix petiolaris (basket willow)	11	0-20	27
Salix planifolia (flat-leaved willow)	45	0-50	13
Shepherdia canadensis (Canada buffaloberry)	1	0-1	7
Spiraea alba (narrow-leaved meadowsweet)	1	0-1	7
Symphoricarpos albus (snowberry)	3	0-3	7
Symphoricarpos occidentalis (buckbrush)	11	0-30	60
Graminoids			
Agropyron smithii (western wheat grass)	5	0-10	13
Agrostis stolonifera (redtop)	14	0-20	20
Agropyron trachycaulum (slender wheat grass)	5	0-10	13
Beckmannia syzigachne (slough grass)	10	0-20	20
Bromus inermis (awnless brome)	27	0-90	60
Calamagrostis canadensis (bluejoint)	16	0-20	27
Carex aquatilis (water sedge)	3	0-3	7
Carex atherodes (awned sedge)	5	0-10	27
Carex praegracilis (graceful sedge)	3	0-3	7
Carex rostrata (beaked sedge)	3	0-3	7

TABLE 25.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Deschampsia cespitosa (tufted hair grass)	1	0-1	7
Eleocharis acicularis (needle spike-rush)	1	0-1	7
Festuca saximontana (Rocky Mountain fescue)	1	0-1	7
Glyceria borealis (northern manna grass)	20	0-20	7
Glyceria spp. (manna grass)	20	0-20	7
Glyceria striata (fowl manna grass)	35	0-60	13
Unknown Grass	1	0-1	7
Juncus balticus (wire rush)	3	0-3	7
Juncus torreyi (Torrey's rush)	10	0-10	7
Muhlenbergia filiformis (slender muhly)	3	0-3	7
Phalaris arundinacea (reed canary grass)	4	0-10	20
Phleum pratense (timothy)	5	0-10	33
Poa palustris (fowl bluegrass)	2	0-3	20
Poa pratensis (Kentucky bluegrass)	14	0-30	53
Forbs			
Achillea millefolium (common yarrow)	3	0-3	7
Achillea sibirica (many-flowered yarrow)	1	0-1	7
Actaea rubra (red and white baneberry)	1	0-1	7
Agastache spp. (giant-hyssop)	1	0-1	7
Anaphalis margaritacea (pearly everlasting)	3	0-3	7
Anemone cylindrica (long-fruited anemone)	10	0-10	7
Artemisia campestris (plains wormwood)	1	0-1	7
Aster ascendens (western aster)	3	0-3	7
Aster borealis (marsh aster)	3	0-3	7
Aster eatonii (Eaton's aster)	3	0-3	7
Aster ericoides (tufted white prairie aster)	7	0-10	13
Aster hesperius (western willow aster)	1	0-1	13
Aster spp. (aster)	1	0-1	7
Castilleja spp. (paintbrush)	1	0-1	7
Castilleja miniata (common red paintbrush)	1	0-1	7
Chrysanthemum leucanthemum (ox-eye daisy)	1	0-1	7
Cicuta maculata (water-hemlock)	7	0-10	20
Cirsium arvense (Canada thistle)	3	0-10	33
Cynoglossum officinale (hound's-tongue)	3	0-3	7
Epilobium angustifolium (common fireweed)	2	0-3	20
Epilobium ciliatum (northern willowherb)	10	0-10	7
Erigeron philadelphicus (Philadelphia fleabane)	1	0-1	7
Unknown Forb	7	0-10	13
Fragaria virginiana (wild strawberry)	2	0-3	33
Galium boreale (northern bedstraw)	2	0-3	13
Galium triflorum (sweet-scented bedstraw)	4	0-10	27
Geranium spp. (geranium)	2	0-3	13
Geranium richardsonii (wild white geranium)	1	0-3	20
Geum aleppicum (yellow avens)	1	0-1	13
Geum macrophyllum (large-leaved yellow avens)	1	0-1	7
Glycyrrhiza lepidota (wild licorice)	3	0-3	13
Hedysarum alpinum (alpine hedysarum)	3	0-3	7
Heracleum lanatum (cow parsnip)	1	0-1	7
Hieracium umbellatum (narrow-leaved hawkweed)	1	0-1	7
Iris missouriensis (western blue flag)	3	0-3	7
Lactuca serriola (prickly lettuce)	1	0-1	7
Lathyrus ochroleucus (cream-colored vetchling)	1	0-3	27
Lysimachia ciliata (fringed loosestrife)	3	0-3	7
Mentha arvensis (wild mint)	1	0-3	27
Osmorhiza depauperata (spreading sweet cicely)	1	0-1	7
Plantago major (common plantain)	1	0-1	7
Polygonum amphibium (water smartweed)	2	0-3	13
Potentilla gracilis (graceful cinquefoil)	1	0-1	20
Potentilla spp. (cinquefoil)	3	0-3	7
Pyrola asarifolia (common pink wintergreen)	4	0-10	20
Ranunculus acris (tall buttercup)	1	0-1	7
Ranunculus gmelinii (yellow water crowfoot)	5	0-10	13
Rorippa palustris (marsh yellow cress)	3	0-3	7
Senecio pauperculus (balsam groundsel)	1	0-1	13
Sium suave (water parsnip)	1	0-1	7

TABLE 25.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Smilacina stellata (star-flowered Solomon's-seal)	3	0-10	47
Solidago canadensis (Canada goldenrod)	5	0-10	47
Solidago graminifolia (flat-topped goldenrod)	1	0-1	7
Sonchus arvensis (perennial sow-thistle)	13	0-20	33
Sonchus spp. (sow-thistle)	10	0-10	7
Stachys palustris (marsh hedge-nettle)	1	0-1	13
Stellaria longifolia (long-leaved chickweed)	1	0-1	7
Streptopus amplexifolius (clasping-leaved twisted-stalk)	1	0-1	13
Taraxacum officinale (common dandelion)	3	0-10	40
Thalictrum spp. (meadow rue)	3	0-3	7
Thalictrum occidentale (western meadow rue)	1	0-1	7
Thalictrum venulosum (veiny meadow rue)	4	0-10	20
Trifolium repens (white clover)	3	0-3	7
Urtica dioica (common nettle)	4	0-10	27
Vicia americana (wild vetch)	2	0-3	20
Viola canadensis (western Canada violet)	2	0-3	13
Ferns and Allies			
Equisetum arvense (common horsetail)	8	0-20	27

Salix bebbiana (beaked willow) is a highly palatable willow to browsing animals. However, this does not seem necessarily to negatively affect the status of *Salix bebbiana* (beaked willow) on a site. In fact, *Salix bebbiana* (beaked willow) seems to have evolved a tolerance to the browsing and can remain on a site under all but the most severe long-term browsing. This tolerance to browsing allows *Salix bebbiana* (beaked willow) to increase at the expense of less tolerant willow species and other desirable shrubs, such as *Cornus stolonifera* (red-osier dogwood). On severely degraded sites with prolonged levels of browsing, *Salix bebbiana* (beaked willow) is typically the last willow remaining on the site.

The degree of dominance of the undergrowth by introduced herbaceous species can be used to indicate the extent of disturbance.

SOILS

Soils are commonly dark brown to black Chernozems, but can intergrade to soils of the Organic order under conditions favorable for organic matter accumulation. Soil texture varies little from clay loam to sandy loam. Water tables are usually within 1 m (39 in) of the soil surface throughout summer. Redoximorphic features (mottles or gleyed soil) are also common within 1 m (39 in) of the soil surface. Estimated available water ranges from low to high.

ADJACENT COMMUNITIES

Adjacent wetter types can include the *Salix bebbiana/Carex atherodes* (beaked willow/awned sedge) habitat type and the *Salix petiolaris/Carex atherodes* (basket willow/awned sedge) habitat type. Drier sites may support the *Populus tremuloides/Cornus stolonifera* (aspen/red-osier dogwood) habitat type or upland species.

MANAGEMENT INFORMATION

Livestock

Stands of the *Salix bebbiana/Cornus stolonifera* (beaked willow/red-osier dogwood) habitat type provide moderate to high forage production, depending on the density of the shrubs. Palatability of the various species associated with this type is often high, and cattle use may be heavy in the late, hot season as upland vegetation cures and animals seek the shade provided by these communities. Livestock will use this type for forage, shade, and as bedding ground. They also browse the young willow shoots and, combined with trampling and soil compaction, can alter both the age structure and vegetation composition of this type.

Cornus stolonifera (red-osier dogwood) is considered an "ice cream" plant by livestock and wildlife. Its abundance, and growth form is a direct indication of past and current use levels. Overuse by livestock will reduce vigour of the willows, as indicated by highlined or clubbed growth forms and dead clumps. With continued overuse, willows can show a sharp decline in vigour, and they may eventually be eliminated from the site.

Frisina (1991) states that for a grazing program to be successful, it must meet the basic biological requirements of the plants present. These are photosynthesis, food storage, reproduction, and seedling establishment. In order to meet these requirements, long periods of rest are needed. It is during the long growing season rest periods that these essential biological processes of food production and storage, reproduction, and seedling establishment occur. In some instances, additional periods of rest may be required to improve or maintain a plant community.

Wildlife

Where the *Salix bebbiana/Cornus stolonifera* (beaked willow/red-osier dogwood) habitat type occurs on winter game ranges, browsing of *Salix bebbiana* (beaked willow) by wild ungulates is often high enough to reduce plant vigour and regeneration. Gaffney (1941) reported that *Salix bebbiana* (beaked willow) is a highly valuable browse for elk, with heavy utilization common. Continued use may lead to conversion to an herbaceous understory such as the *Poa palustris* (fowl bluegrass), *Poa pratensis* (Kentucky bluegrass), or *Bromus inermis* (awnless brome). Moose and beaver also heavily utilize *Salix bebbiana* (beaked willow).

Fisheries

The importance of willows in streambank stabilization, cover, and thermal protection for fisheries cannot be over emphasized. The herbaceous understory aids in filtering out sediments during overbank flows, thereby contributing to streambank building.

Fire

Salix bebbiana (beaked willow) sprouts rapidly following fire (Haeussler and Coates 1986). Quick, hot fires maximize sprouting, while slower burns cause more damage to plants. Prescribed burning is a commonly used wildlife management tool to rejuvenate decadent communities dominated by *Salix bebbiana* (beaked willow). The light seeds readily colonize exposed mineral soil after hot fires. The degree to which this species invades after fire, however, depends on the time of year, weather, and presence of a mineral seedbed. The chance of *Salix bebbiana* (beaked willow) establishing after a fire decreases, as available mineral soil seedbeds become occupied by faster growing herbaceous species and mosses. Prescribed burning is a common wildlife management tool used to rejuvenate decadent *Salix bebbiana* (beaked willow) communities (USDA IFSL 1995).

Soil Management and Rehabilitation Opportunities

The *Salix bebbiana/Cornus stolonifera* (beaked willow/red-osier dogwood) habitat type receives high use by wildlife and cattle. Soils and streambanks are susceptible to trampling damage, especially when soils are fine textured or wet. Deferring grazing until sites are drier can reduce trampling and compaction problems (Marlow 1984).

Salix bebbiana (beaked willow) is valuable for revegetating streambanks. Cuttings are best taken in the spring, from dormant two to four year old wood. Cuttings 30-50 cm (12-20 in) long and more than 1 cm (0.5 in) in diameter produce the best results, with the cuttings rooting freely along the entire length of the stem. Shoots from cuttings can be expected to appear 10-20 days after planting. However, use of rooted cuttings and nursery grown stock will produce better results.

OTHER STUDIES

The *Salix bebbiana/Cornus stolonifera* (beaked willow/red-osier dogwood) habitat type has not been described by others. A *Salix bebbiana* (beaked willow) community is described by Lawrence and Romo (1994) on the Matador Research Station in southern Saskatchewan with *Cornus stolonifera* (red-osier dogwood) as a significant constituent.

Salix bebbiana Community Type
(Beaked Willow Community Type)

SALIBEB
Number of Stands Sampled = 27
Number of Stands Sampled in Saskatchewan = 1

LOCATION AND ASSOCIATED LANDFORMS

The *Salix bebbiana* (beaked willow) community type is a minor type in the Moist Mixed Grass Ecoregion, the Mixed Grass Ecoregion, and the Aspen Parkland Ecoregion. It occupies alluvial terraces and moist to wet areas near springs, seeps, and subirrigated meadows.

VEGETATION

The *Salix bebbiana* (beaked willow) community type represents a browsing/grazing disclimax where the natural understories of palatable shrubs and/or sedges have been eliminated by overgrazing. *Salix bebbiana* (beaked willow) dominates this community type. Also commonly present are the shrubs *Rosa* species (rose) and *Ribes* species (currant) and a diverse group of disturbance-related herbaceous species is present, including *Poa pratensis* (Kentucky bluegrass), *Phleum pratense* (timothy), *Equisetum arvense* (common horsetail), *Taraxaacum officinale* (common dandelion), and *Frageria virginianna* (wild strawberry) (Table 26).

Table 26. Average canopy cover, range of canopy cover, and constancy for species recorded in 27 sampled stands of the grazing disclimax *Salix bebbiana* (beaked willow) community type

TABLE 26.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Trees			
Abies balsamea (balsam fir)	1	0-1	4
Betula papyrifera (white birch)	3	0-3	7
Picea spp. (spruce)	1	0-1	4
Picea glauca (white spruce)	1	0-1	15
Populus balsamifera (balsam poplar)	3	0-10	15
Populus tremuloides (aspen)	1	0-1	4
Shrubs			
Amelanchier alnifolia (Saskatoon)	2	0-3	19
Betula occidentalis (water birch)	3	0-3	4
Cornus stolonifera (red-osier dogwood)	1	0-1	22
Corylus cornuta (beaked hazelnut)	3	0-3	4
Elaeagnus commutata (silverberry)	3	0-3	4
Linnaea borealis (twinflower)	3	0-3	4
Lonicera involucrata (bracted honeysuckle)	2	0-3	19
Lonicera utahensis (red twinberry)	1	0-1	4
Potentilla fruticosa (shrubby cinquefoil)	1	0-3	22
Ribes americanum (wild black currant)	1	0-1	7
Ribes lacustre (bristly black currant)	3	0-3	4
Ribes oxyacanthoides (northern gooseberry)	6	0-20	41
Ribes spp. (currant)	3	0-3	7
Ribes triste (wild red currant)	1	0-1	4
Rosa woodsii (common wild rose)	2	0-3	7
Rosa spp. (rose)	3	0-10	56
Rubus idaeus (wild red raspberry)	7	0-40	26
Rubus parviflorus (thimbleberry)	1	0-1	4
Rubus pubescens (dewberry)	1	0-3	11

TABLE 26.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Salix bebbiana (beaked willow)	56	20-98	100
Salix discolor (pussy willow)	10	0-10	4
Salix drummondiana (Drummond's willow)	3	0-3	4
Salix lutea (yellow willow)	8	0-20	11
Salix maccalliana (velvet-fruited willow)	3	0-3	4
Salix myrtillifolia (myrtle-leaved willow)	9	0-20	22
Salix petiolaris (basket willow)	8	0-20	15
Salix planifolia (flat-leaved willow)	9	0-20	26
Salix pseudomonticola (false mountain willow)	7	0-20	30
Salix scouleriana (Scouler's willow)	10	0-10	4
Shepherdia canadensis (Canada buffaloberry)	10	0-10	4
Symphoricarpos albus (snowberry)	5	0-10	7
Symphoricarpos spp. (buckbrush)	1	0-1	4
Symphoricarpos occidentalis (buckbrush)	17	0-50	19
Graminoids			
Agrostis exarata (spike redtop)	3	0-3	4
Agropyron repens (quack grass)	1	0-3	15
Agrostis scabra (rough hair grass)	1	0-1	4
Agropyron smithii (western wheat grass)	10	0-10	4
Agrostis spp. (Agrostis)	1	0-1	7
Agrostis stolonifera (redtop)	5	0-10	11
Agropyron trachycaulum (slender wheat grass)	1	0-3	22
Alopecurus aequalis (short-awned foxtail)	3	0-3	4
Alopecurus occidentalis (alpine foxtail)	3	0-3	11
Bromus ciliatus (fringed brome)	3	0-10	37
Bromus inermis (awnless brome)	24	0-80	22
Calamagrostis canadensis (bluejoint)	9	0-40	44
Calamagrostis stricta (narrow reed grass)	2	0-3	11
Carex aquatilis (water sedge)	3	0-3	4
Carex atherodes (awned sedge)	2	0-3	7
Carex curta (short sedge)	1	0-1	4
Carex lanuginosa (woolly sedge)	1	0-3	11
Carex microglochin (short-awned sedge)	2	0-3	11
Carex praegracilis (graceful sedge)	1	0-1	4
Carex rostrata (beaked sedge)	1	0-1	4
Carex sartwellii (Sartwell's sedge)	3	0-3	4
Carex scopulorum (Holn's Rocky Mountain sedge)	20	0-20	4
Carex sprengelii (Sprengel's sedge)	1	0-1	4
Deschampsia cespitosa (tufted hair grass)	2	0-3	11
Elymus glaucus (smooth wild rye)	5	0-10	7
Elymus virginicus (Virginia wild rye)	1	0-1	4
Festuca pratensis (meadow fescue)	3	0-3	4
Festuca subulata (fescue)	1	0-1	4
Glyceria striata (fowl manna grass)	11	0-40	19
Hordeum jubatum (foxtail barley)	1	0-1	4
Juncus balticus (wire rush)	26	0-80	22
Oryzopsis asperifolia (white-grained mountain rice grass)	1	0-1	4
Phleum pratense (timothy)	12	0-50	59
Poa palustris (fowl bluegrass)	9	0-50	37
Poa pratensis (Kentucky bluegrass)	12	0-30	63
Schizachne purpurascens (purple oat grass)	3	0-3	4
Forbs			
Achillea millefolium (common yarrow)	1	0-3	48
Actaea rubra (red and white baneberry)	1	0-3	19
Allium schoenoprasum (wild chives)	1	0-1	7
Anemone cylindrica (long-fruited anemone)	1	0-1	4
Angelica arguta (white angelica)	1	0-1	11
Aralia nudicaulis (wild sarsaparilla)	7	0-10	7
Arctium spp. (burdock)	3	0-3	4
Artemisia ludoviciana (prairie sagewort)	1	0-1	4
Aster ascendens (western aster)	2	0-3	7
Aster borealis (marsh aster)	1	0-3	15
Aster ciliolatus (Lindley's aster)	2	0-3	15
Aster conspicuus (showy aster)	2	0-3	11
Aster eatonii (Eaton's aster)	10	0-10	4
Aster ericoides (tufted white prairie aster)	1	0-3	11
Aster hesperius (western willow aster)	1	0-1	7
Aster laevis (smooth aster)	3	0-10	30
Aster modestus (large northern aster)	2	0-3	15

TABLE 26.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Aster subspicatus (leafy-bracted aster)	3	0-3	7
Campanula rotundifolia (harebell)	1	0-1	4
Castilleja spp. (paintbrush)	2	0-3	7
Castilleja rhexifolia (alpine red paintbrush)	1	0-1	4
Cerastium nutans (long-stalked mouse-ear chickweed)	1	0-1	4
Cerastium vulgatum (common mouse-ear chickweed)	1	0-1	4
Chrysosplenium iowense (golden saxifrage)	1	0-1	4
Cicuta maculata (water-hemlock)	1	0-1	4
Circaea alpina (small enchanter's nightshade)	40	0-40	4
Cirsium arvense (Canada thistle)	2	0-10	48
Cirsium scariosum (thistle)	1	0-1	4
Convolvulus arvensis (field bindweed)	1	0-1	4
Delphinium glaucum (tall larkspur)	1	0-3	19
Disporum trachycarpum (fairybells)	1	0-1	4
Epilobium angustifolium (common fireweed)	1	0-3	30
Epilobium ciliatum (northern willowherb)	1	0-3	15
Erigeron philadelphicus (Philadelphia fleabane)	1	0-1	4
Erysimum cheiranthoides (wormseed mustard)	1	0-1	4
Unknown Forb	1	0-1	4
Fragaria virginiana (wild strawberry)	1	0-3	52
Galeopsis tetrahit (hemp-nettle)	1	0-1	4
Galium boreale (northern bedstraw)	1	0-3	37
Galium trifidum (small bedstraw)	20	0-20	4
Galium triflorum (sweet-scented bedstraw)	2	0-3	22
Geranium spp. (geranium)	2	0-3	7
Geranium richardsonii (wild white geranium)	4	0-10	37
Geum aleppicum (yellow avens)	2	0-3	11
Geum macrophyllum (large-leaved yellow avens)	3	0-10	44
Glycyrrhiza lepidota (wild licorice)	1	0-1	4
Habenaria hyperborea (northern green bog orchid)	1	0-1	4
Hackelia americana (nodding stickseed)	1	0-1	7
Hackelia floribunda (large-flowered stickseed)	1	0-1	4
Halenia deflexa (spurred gentian)	1	0-1	4
Helianthus nuttallii (common tall sunflower)	1	0-1	4
Heracleum lanatum (cow parsnip)	7	0-20	37
Lappula spp. (bluebur)	1	0-1	4
Lathyrus ochroleucus (cream-colored vetchling)	1	0-3	19
Lysimachia ciliata (fringed loosestrife)	1	0-1	4
Medicago lupulina (black medick)	1	0-1	4
Mentha arvensis (wild mint)	3	0-10	22
Mertensia paniculata (tall lungwort)	5	0-10	11
Mitella nuda (bishop's-cap)	1	0-1	7
Osmorhiza chilensis (blunt-fruited sweet cicely)	1	0-1	4
Osmorhiza depauperata (spreading sweet cicely)	1	0-1	4
Osmorhiza occidentalis (western sweet cicely)	1	0-1	4
Pedicularis bracteosa (western lousewort)	3	0-3	4
Perideridia gairdneri (squawroot)	1	0-1	7
Petasites palmatus (palmate-leaved coltsfoot)	2	0-3	7
Petasites sagittatus (arrow-leaved coltsfoot)	5	0-10	7
Plantago major (common plantain)	1	0-1	15
Polygonum lapathifolium (pale persicaria)	1	0-1	4
Potentilla anserina (silverweed)	1	0-1	4
Potentilla gracilis (graceful cinquefoil)	1	0-3	15
Potentilla norvegica (rough cinquefoil)	3	0-3	4
Pyrola asarifolia (common pink wintergreen)	1	0-1	4
Ranunculus acris (tall buttercup)	20	0-20	4
Ranunculus sceleratus (celery-leaved buttercup)	3	0-3	4
Rumex occidentalis (western dock)	1	0-1	4
Sanicula marilandica (snakeroot)	1	0-1	7
Scutellaria galericulata (marsh skullcap)	1	0-1	4
Senecio eremophilus (cut-leaved ragwort)	1	0-1	4

TABLE 26.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Senecio foetidus (marsh butterweed)	3	0-3	4
Senecio pauperculus (balsam groundsel)	1	0-3	22
Senecio pauciflorus (few-flowered ragwort)	3	0-3	4
Senecio triangularis (brook ragwort)	1	0-1	4
Sisymbrium loeselii (tall hedge mustard)	1	0-1	4
Sium suave (water parsnip)	3	0-3	4
Smilacina racemosa (false Solomon's-seal)	1	0-1	7
Smilacina stellata (star-flowered Solomon's-seal)	1	0-3	33
Solidago canadensis (Canada goldenrod)	4	0-20	26
Solidago gigantea (late goldenrod)	2	0-3	7
Solidago missouriensis (low goldenrod)	7	0-10	11
Sonchus arvensis (perennial sow-thistle)	25	0-50	7
Sonchus spp. (sow-thistle)	1	0-1	4
Sparganium spp. (sparganium)	1	0-1	4
Stachys palustris (marsh hedge-nettle)	2	0-10	37
Stellaria calycantha (northern stitchwort)	1	0-1	7
Stellaria longipes (long-stalked chickweed)	1	0-1	4
Streptopus amplexifolius (clasping-leaved twisted-stalk)	1	0-3	11
Taraxacum officinale (common dandelion)	3	0-20	70
Thalictrum spp. (meadow rue)	1	0-1	4
Thalictrum occidentale (western meadow rue)	4	0-20	19
Thalictrum venulosum (veiny meadow rue)	2	0-3	22
Thlaspi arvense (stinkweed)	1	0-1	4
Trifolium repens (white clover)	12	0-50	22
Urtica dioica (common nettle)	2	0-10	33
Vicia americana (wild vetch)	1	0-3	63
Viola spp. (violet)	1	0-1	7
Viola canadensis (western Canada violet)	1	0-1	11
Viola palustris (marsh violet)	2	0-3	7
Zizia aptera (heart-leaved Alexanders)	1	0-1	4
Ferns and Allies			
Equisetum arvense (common horsetail)	5	0-30	52
Equisetum fluviatile (swamp horsetail)	1	0-1	4
Equisetum spp. (horsetail)	1	0-1	4

SUCCESSIONAL INFORMATION

In most cases, the *Salix bebbiana* (beaked willow) community type is a browsing/grazing disclimax of the *Salix bebbiana/Carex atherodes* (beaked willow/awned sedge) habitat type or the *Salix bebbiana/Cornus stolonifera* (beaked willow/red-osier dogwood) habitat type.

Salix bebbiana (beaked willow) is a highly palatable willow to browsing animals. However, this does not seem to negatively affect the status of *Salix bebbiana* (beaked willow) on a site. In fact, *Salix bebbiana* (beaked willow) seems to have evolved a tolerance to the browsing and can remain on a site under all but the most severe long-term browsing. This tolerance to browsing allows *Salix bebbiana* (beaked willow) to increase at the expense of less tolerant willow species and other desirable shrubs, such as *Cornus stolonifera* (red-osier dogwood). On severely degraded sites with prolonged levels of browsing, *Salix bebbiana* (beaked willow) is typically the last willow species to remain on the site. The degree of dominance of the undergrowth by introduced herbaceous species can aid in determining the extent of disturbance.

SOILS

Soils are commonly dark brown to black Chernozems, but can intergrade to soils of the Organic order under conditions favorable for organic matter accumulation. Soil texture varies little from clay loam to sandy loam. Water tables are usually within 1 m (39 in) of the soil surface throughout summer. Redoximorphic features (mottles or gleyed soil) are also common within 1 m (39 in) of the soil surface. Estimated available water ranges from low to high.

ADJACENT COMMUNITIES

Adjacent wetter types can include the *Carex atherodes* (awned sedge) habitat type and the *Salix petiolaris/Carex atherodes* (basket willow/awned sedge) habitat type. Drier sites may support such types as the *Populus tremuloides/Cornus stolonifera* (aspen/red-osier dogwood) habitat type, the *Bromus inermis* (awnless brome) community type, or upland species.

MANAGEMENT INFORMATION

Livestock

Stands of the *Salix bebbiana* (beaked willow) community type are often populated by widely spaced shrubs, allowing for easy livestock access. Forage production is moderate to high, and as a result, heavy use by livestock is common. The moist, fine textured soils are extremely susceptible to trampling damage, becoming compacted and hummocked with prolonged presence of livestock. In some stands, the willows may have a reduced vigour, indicated by highlining, clubbing, or decadent clumps. With continued overuse, willows can show a sharp decline in vigour, and they may eventually be eliminated from the site.

Frisina (1991) states that for a grazing program to be successful, it must meet the basic biological requirements of the plants present. These are photosynthesis, food storage, reproduction, and seedling establishment. In order to meet these requirements, long periods of rest are needed. It is during the long growing season rest periods that these essential biological processes of food production and storage, reproduction, and seedling establishment occur. In some instances, additional periods of rest may be required to improve or maintain a plant community.

Wildlife

Where this community type occurs on winter game ranges, browsing of *Salix bebbiana* (beaked willow) is often high enough to reduce both plant vigour and regeneration. Gaffney (1941) reported that *Salix bebbiana* (beaked willow) is a highly valuable browse for elk, with heavy utilization common. Continued use may lead to a conversion to herbaceous communities such as the *Poa palustris* (fowl bluegrass) and *Poa pratensis* (Kentucky bluegrass) community types. Moose and beaver heavily utilize most species of willow.

Fisheries

The importance of willows in streambank stabilization, cover, and thermal protection for fisheries cannot be over emphasized. The herbaceous understory aids in filtering out sediments during overbank flows, thereby contributing to streambank building.

Fire

Salix bebbiana (beaked willow) sprouts rapidly following fire (Haeussler and Coates 1986). Quick, hot fires maximize sprouting, while slower burns cause more damage to plants. Prescribed burning is a commonly used wildlife management tool to rejuvenate decadent communities dominated by *Salix bebbiana* (beaked willow). The light seeds readily colonize exposed mineral soil after hot fires. The degree to which this species invades after fire, however, depends on the time of year, weather, and presence of a mineral seedbed. The chance of beaked willow establishing after a fire lessens, as available mineral soil seedbeds become occupied by faster growing herbaceous species and mosses. Prescribed burning is a common wildlife management tool used to rejuvenate decadent beaked willow communities (USDA IFSL 1995).

Soil Management and Rehabilitation Opportunities

The *Salix bebbiana* (beaked willow) community type receives high use by wildlife and cattle. Soils and streambanks are highly susceptible to trampling damage, especially when soils are fine textured or wet. Deferring grazing until sites are drier can reduce trampling and compaction problems (Marlow 1984). Unless the high water tables are maintained, the understories in these stands will be converted to dominance by introduced grass species and weedy forbs.

Salix bebbiana (beaked willow) is valuable for revegetating streambanks. Cuttings are best taken in the spring, from dormant two to four year old wood. Cuttings 30-50 cm (12-20 in) long and more than 1 cm (0.5 in) in diameter produce the best results, with the cuttings rooting freely along the entire length of the stem. Shoots from cuttings can be expected to appear 10-20 days after planting. However, use of rooted cuttings and nursery grown stock will produce better results.

OTHER STUDIES

A *Salix bebbiana* (beaked willow) community type is described by Hansen and others (1995) for Montana. A similar *Salix bebbiana* (beaked willow) community type was identified by Padgett and others (1989) in Utah, with an undergrowth dominated by *Poa pratensis* (Kentucky bluegrass) and other mesic grasses. Chadde and others (1988) defined a *Salix bebbiana/Agrostis stolonifera* (beaked willow/redtop) community type for northern Yellowstone National Park. A *Salix bebbiana* (beaked willow) community is described by Lawrence and Romo (1994) on the Matador Research Station in southern Saskatchewan.

Salix exigua Community Type
(Sandbar Willow Community Type)

SALIEXI

Number of Stands Sampled = 70

Number of Stands Sampled in Saskatchewan = 15

LOCATION AND ASSOCIATED LANDFORMS

The *Salix exigua* (sandbar willow) community type is a major, widespread type at low to mid elevations throughout Saskatchewan. Typical sites of this type are moist alluvial deposits subject to flooding each year along streambanks, ditches, and lakeshores.

VEGETATION

Salix exigua (sandbar willow) is the major shrub species of this pioneer, or early seral, community type. *Salix lutea* (yellow willow) may be present, indicating a possible successional trend toward a communities dominated by that species. Herbaceous species present include a wide variety of pioneering species (Table 27).

Table 27. Average canopy cover, range of canopy cover, and constancy for species recorded in 18 stands of the *Salix exigua* (sandbar willow) community type that are relatively undisturbed by livestock or wildlife

TABLE 27.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Trees			
Acer negundo (Manitoba maple)	3	0-3	6
Populus balsamifera (balsam poplar)	1	0-1	6
Populus deltoides (plains cottonwood)	1	0-1	11
Shrubs			
Cornus stolonifera (red-osier dogwood)	1	0-3	17
Rosa woodsii (common wild rose)	3	0-3	6

TABLE 27.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Rosa spp. (rose)	1	0-3	22
Salix amygdaloides (peach-leaved willow)	3	0-3	6
Salix exigua (sandbar willow)	86	40-98	100
Salix lutea (yellow willow)	2	0-3	11
Salix petiolaris (basket willow)	3	0-3	6
Symphoricarpos occidentalis (buckbrush)	1	0-1	11
Graminoids			
Agropyron smithii (western wheat grass)	2	0-3	22
Agrostis stolonifera (redtop)	21	0-80	22
Agropyron trachycaulum (slender wheat grass)	3	0-3	6
Bromus inermis (awnless brome)	5	0-10	17
Carex aquatilis (water sedge)	30	0-30	6
Carex lanuginosa (woolly sedge)	3	0-3	6
Carex rostrata (beaked sedge)	80	0-80	6
Echinochloa crusgalli (barnyard grass)	20	0-20	6
Elymus canadensis (Canada wild rye)	20	0-20	6
Elymus virginicus (Virginia wild rye)	12	0-20	11
Hordeum jubatum (foxtail barley)	2	0-3	11
Phalaris arundinacea (reed canary grass)	79	0-98	11
Poa palustris (fowl bluegrass)	20	0-20	11
Poa pratensis (Kentucky bluegrass)	2	0-3	11
Scirpus pungens (three-square rush)	1	0-1	6
Spartina gracilis (alkali cord grass)	80	0-80	6
Spartina pectinata (prairie cord grass)	40	0-80	17
Forbs			
Apocynum androsaemifolium (spreading dogbane)	3	0-3	6
Apocynum cannabinum (Indian hemp)	2	0-3	17
Artemisia dracunculus (dragonwort)	1	0-1	6
Artemisia ludoviciana (prairie sagewort)	1	0-1	6
Aster ericoides (tufted white prairie aster)	1	0-1	6
Aster spp. (aster)	3	0-3	6
Bidens cernua (nodding beggarticks)	1	0-1	6
Chenopodium album (lamb's-quarters)	1	0-1	6
Cirsium arvense (Canada thistle)	2	0-3	11
Crepis tectorum (annual hawk's-beard)	1	0-1	6
Epilobium ciliatum (northern willowherb)	3	0-3	6
Glycyrrhiza lepidota (wild licorice)	5	0-10	17
Helianthus nuttallii (common tall sunflower)	3	0-3	6
Lycopus asper (western water-horehound)	1	0-1	6
Melilotus officinalis (yellow sweet-clover)	3	0-3	6
Mentha arvensis (wild mint)	2	0-3	11
Plantago major (common plantain)	1	0-1	6
Polygonum amphibium (water smartweed)	14	0-20	17
Polygonum coccineum (water smartweed)	3	0-3	6
Potentilla anserina (silverweed)	1	0-1	6
Potentilla argentea (silvery cinquefoil)	3	0-3	6
Pyrola asarifolia (common pink wintergreen)	1	0-1	6
Rumex crispus (curled dock)	1	0-1	6
Rumex maritimus (golden dock)	20	0-20	6
Rumex triangulivalvis (narrow-leaved dock)	1	0-1	6
Salsola kali (Russian-thistle)	1	0-1	6
Sium suave (water parsnip)	3	0-3	6
Solidago canadensis (Canada goldenrod)	2	0-3	22
Sonchus arvensis (perennial sow-thistle)	2	0-3	11
Sonchus asper (prickly annual sow-thistle)	3	0-3	6
Sonchus spp. (sow-thistle)	1	0-1	6
Taraxacum officinale (common dandelion)	2	0-3	17
Thermopsis rhombifolia (golden bean)	10	0-10	6
Trifolium repens (white clover)	1	0-1	6
Typha latifolia (common cattail)	3	0-3	6
Verbena hastata (blue vervain)	20	0-20	6
Vicia americana (wild vetch)	1	0-1	6
Xanthium strumarium (cocklebur)	2	0-3	17
Ferns and Allies			
Equisetum arvense (common horsetail)	13	0-20	22
Equisetum hyemale (common scouring-rush)	10	0-10	6

SUCCESSIONAL INFORMATION

The *Salix exigua* (sandbar willow) community type is an early seral (pioneer) primary successional stage on newly deposited sediments that may persist under a regime of repeated fluvial disturbance. It commonly occurs in open stands of *Populus balsamifera* (balsam poplar), or *Populus deltoides* (plains cottonwood), or as a fringe around dense cottonwood stands.

Many stands of *Salix exigua* (sandbar willow) are seral to the *Salix lutea/Cornus stolonifera* (yellow willow/red-osier dogwood) habitat type.

In southern Saskatchewan, some stands may be seral to the *Acer negundo/Prunus virginiana* (Manitoba maple/choke cherry) or *Fraxinus pennsylvanica/Prunus virginiana* (green ash/choke cherry) habitat type. Seedlings of both *Salix exigua* (sandbar willow) and *Populus deltoides* (plains cottonwood) are typically established at the same time on alluvial mud flats. Initially, *Salix exigua* (sandbar willow) may grow faster than *Populus deltoides* (plains cottonwood). However, in a few years, saplings of *Populus deltoides* (plains cottonwood) will outgrow *Salix exigua* (sandbar willow) and begin to dominate the overstory. As the dense overstory of *Populus deltoides* (plains cottonwood) matures, *Salix exigua* (sandbar willow) is shaded. While the *Salix exigua* (sandbar willow) is being shaded out, the understory is becoming dominated by seedlings, saplings, and pole size *Acer negundo* (Manitoba maple).

Disturbance Stages

Salix exigua (sandbar willow) is highly adapted to most forms of disturbance. It is a prolific sprouter and will reestablish itself on sites dominated by *Glycyrrhiza lepidota* (wild licorice) and *Agropyron smithii* (western wheat grass) following release from heavy grazing pressure, provided it has not been totally removed from the site. Heavy grazing may open up stands resulting in invasion by exotic species or less palatable native species (Table 28).

Table 28. Average canopy cover, range of canopy cover, and constancy for species recorded in 52 disturbed stands of the *Salix exigua* (sandbar willow) community type

TABLE 28.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Trees			
Acer negundo (Manitoba maple)	1	0-3	6
Fraxinus pennsylvanica (green ash)	2	0-3	4
Populus angustifolia (narrow-leaf cottonwood)	1	0-1	2
Populus deltoides (plains cottonwood)	5	0-20	12
Shrubs			
Artemisia cana (silver sagebrush)	10	0-10	2
Clematis ligusticifolia (western clematis)	3	0-3	4
Cornus stolonifera (red-osier dogwood)	13	0-50	29
Elaeagnus commutata (silverberry)	1	0-1	2
Prunus virginiana (choke cherry)	7	0-10	12
Ribes americanum (wild black currant)	20	0-20	2
Ribes aureum (golden currant)	18	0-40	6
Ribes hudsonianum (northern black currant)	20	0-20	2
Ribes oxyacanthoides (northern gooseberry)	2	0-3	4
Ribes spp. (currant)	3	0-3	2
Rosa acicularis (prickly rose)	60	0-60	2
Rosa woodsii (common wild rose)	31	0-60	27
Rosa spp. (rose)	10	0-50	19
Rubus idaeus (wild red raspberry)	1	0-1	2
Salix amygdaloides (peach-leaved willow)	2	0-3	8
Salix bebbiana (beaked willow)	1	0-1	2
Salix boothii (Booth's willow)	1	0-1	4
Salix exigua (sandbar willow)	77	40-98	100
Salix lutea (yellow willow)	3	0-10	21
Symphoricarpos occidentalis (buckbrush)	22	0-60	31
Graminoids			
Agropyron dasystachyum (northern wheat grass)	1	0-1	2
Agropyron repens (quack grass)	3	0-3	4

Agropyron smithii (western wheat grass)	26	0-70	23
Agrostis stolonifera (redtop)	20	0-80	17
Agropyron trachycaulum (slender wheat grass)	11	0-20	10
Alopecurus aequalis (short-awned foxtail)	1	0-1	2
Beckmannia syzigachne (slough grass)	2	0-3	4
Bromus inermis (awnless brome)	32	0-90	48
Bromus japonicus (Japanese chess)	1	0-1	2
Bromus tectorum (downy chess)	10	0-20	4
Carex atherodes (awned sedge)	9	0-30	8
Carex lanuginosa (woolly sedge)	3	0-3	4
Carex rostrata (beaked sedge)	1	0-1	2
Carex sprengelii (Sprengel's sedge)	3	0-3	2
Carex spp. (sedge)	3	0-3	2
Dactylis glomerata (orchard grass)	30	0-40	4
Deschampsia cespitosa (tufted hair grass)	1	0-1	2
Eleocharis palustris (creeping spike-rush)	30	0-30	2
Elymus canadensis (Canada wild rye)	13	0-40	8
Elymus piperi (giant wild rye)	17	0-30	4
Glyceria grandis (common tall manna grass)	1	0-1	2
Hordeum jubatum (foxtail barley)	4	0-20	19
Juncus balticus (wire rush)	7	0-10	4
Muhlenbergia asperifolia (scratch grass)	1	0-1	2
Phalaris arundinacea (reed canary grass)	15	0-50	19
Phleum pratense (timothy)	7	0-20	10
Poa compressa (Canada bluegrass)	1	0-1	2
Poa palustris (fowl bluegrass)	11	0-40	19
Poa pratensis (Kentucky bluegrass)	28	0-70	33
Poa spp. (bluegrass)	3	0-3	2
Scirpus pungens (three-square rush)	2	0-3	8
Stipa comata (needle-and-thread)	1	0-1	2
Stipa viridula (green needle grass)	1	0-1	2
Forbs			
Achillea millefolium (common yarrow)	1	0-1	2
Ambrosia psilostachya (perennial ragweed)	3	0-3	2
Apocynum androsaemifolium (spreading dogbane)	40	0-40	4
Apocynum cannabinum (Indian hemp)	1	0-1	2
Arctium spp. (burdock)	1	0-1	2
Arctium lappa (great burdock)	1	0-1	2
Arctium minus (common burdock)	3	0-3	2
Arnica amplexicaulis (stem-clasping arnica)	1	0-1	2
Artemisia absinthium (absinthe wormwood)	5	0-10	6
Artemisia biennis (biennial sagewort)	5	0-10	4
Artemisia dracunculus (dragonwort)	1	0-1	2
Artemisia ludoviciana (prairie sagewort)	3	0-10	10
Asclepias speciosa (showy milkweed)	1	0-1	2
Aster borealis (marsh aster)	2	0-3	8
Aster brachyactis (rayless aster)	3	0-3	2
Aster eatonii (Eaton's aster)	1	0-1	2
Aster ericoides (tufted white prairie aster)	2	0-3	4
Aster hesperius (western willow aster)	1	0-1	6
Aster laevis (smooth aster)	1	0-1	2
Chenopodium album (lamb's-quarters)	1	0-1	2
Chenopodium fremontii (Fremont's goosefoot)	10	0-10	2
Cicuta maculata (water-hemlock)	1	0-1	4
Cirsium arvense (Canada thistle)	14	0-60	44
Convolvulus arvensis (field bindweed)	2	0-3	4
Convolvulus sepium (wild morning-glory)	2	0-3	4
Cynoglossum officinale (hound's-tongue)	2	0-3	4
Descurainia pinnata (green tansy mustard)	1	0-1	2
Descurainia sophia (flixweed)	5	0-10	4
Epilobium ciliatum (northern willowherb)	2	0-3	4
Erysimum cheiranthoides (wormseed mustard)	3	0-3	2
Euphorbia esula (leafy spurge)	1	0-1	2
Unknown Forb	3	0-3	2
Galium aparine (cleavers)	10	0-20	4
Galium boreale (northern bedstraw)	3	0-3	2
Geum macrophyllum (large-leaved yellow avens)	1	0-1	2
Glycyrrhiza lepidota (wild licorice)	14	0-40	31
Helenium autumnale (sneezeweed)	1	0-1	2
Helianthus nuttallii (common tall sunflower)	1	0-1	2
Heracleum lanatum (cow parsnip)	10	0-20	4

Humulus lupulus (common hop)	3	0-3	2
Kochia scoparia (summer-cypress)	12	0-20	4
Lactuca pulchella (common blue lettuce)	1	0-1	2
Lycopus americanus (American water-horehound)	3	0-3	2
Melilotus alba (white sweet-clover)	9	0-40	10
Melilotus officinalis (yellow sweet-clover)	5	0-20	17
Mentha arvensis (wild mint)	9	0-20	10
Plantago major (common plantain)	1	0-1	4
Polygonum amphibium (water smartweed)	14	0-40	12
Polygonum lapathifolium (pale persicaria)	1	0-1	2
Potentilla anserina (silverweed)	3	0-3	6
Potentilla gracilis (graceful cinquefoil)	1	0-1	2
Potentilla norvegica (rough cinquefoil)	1	0-1	2
Potentilla paradoxa (bushy cinquefoil)	7	0-10	4
Potentilla rivalis (brook cinquefoil)	10	0-10	2
Rorippa sylvestris (creeping yellow cress)	20	0-20	2
Rumex crispus (curled dock)	6	0-20	8
Rumex occidentalis (western dock)	3	0-3	4
Rumex triangulivalvis (narrow-leaved dock)	2	0-3	4
Salsola kali (Russian-thistle)	12	0-20	4
Smilacina stellata (star-flowered Solomon's-seal)	5	0-10	4
Solidago canadensis (Canada goldenrod)	15	0-60	13
Solidago spp. (goldenrod)	2	0-3	4
Solidago gigantea (late goldenrod)	5	0-10	6
Solidago missouriensis (low goldenrod)	2	0-3	4
Solidago rigida (stiff goldenrod)	3	0-3	2
Sonchus arvensis (perennial sow-thistle)	10	0-20	10
Sonchus asper (prickly annual sow-thistle)	20	0-40	4
Sonchus spp. (sow-thistle)	1	0-1	4
Stachys palustris (marsh hedge-nettle)	2	0-3	6
Taraxacum officinale (common dandelion)	1	0-3	12
Thalictrum dasycarpum (tall meadow rue)	1	0-1	4
Thlaspi arvense (stinkweed)	1	0-1	2
Tragopogon dubius (common goat's-beard)	1	0-1	2
Trifolium repens (white clover)	2	0-3	4
Typha latifolia (common cattail)	7	0-10	4
Urtica dioica (common nettle)	1	0-3	10
Vicia americana (wild vetch)	12	0-20	4
Xanthium strumarium (cocklebur)	2	0-3	10
Ferns and Allies			
Equisetum arvense (common horsetail)	12	0-30	15

SOILS

Soils are Regosols or rarely Chernozems, and they may range from sandy gravels to heavy clays. Surface soils are usually moist in the spring and early summer; subsoils remain saturated throughout the growing season.

ADJACENT COMMUNITIES

Wetter communities are usually absent, but there may be narrow bands of such pioneer graminoids as *Eleocharis palustris* (creeping spike-rush) or *Phalaris arundinacea* (reed canary grass) at the water's edge. Adjacent drier communities include the *Populus balsamifera* (balsam poplar), *Populus deltoides* (plains cottonwood), *Salix lutea* (yellow willow), and *Bromus inermis* (awnless brome) types.

MANAGEMENT INFORMATION

Livestock

Forage production is low to occasionally moderate because of the high densities of *Salix exigua* (sandbar willow) stems. Dense stands inhibit livestock access.

Overuse by livestock will result in a reduced vigour by the willows present, as illustrated by highlining, clubbing, or dead clumps. With continued overuse, willows can show a sharp decline in vigour, and they may eventually be eliminated from the site. However, release from heavy grazing pressure will allow them to reestablish, provided they have not been totally removed from the site.

Frisina (1991) states that for a grazing program to be successful, it must meet the basic biological requirements of the plants present. These are photosynthesis, food storage, reproduction, and seedling establishment. In order to meet these requirements, long periods of rest are needed. It is during the long growing season rest periods that these essential biological processes of food production and storage, reproduction, and seedling establishment occur. In some instances, additional periods of rest may be required to improve or maintain a plant community.

Wildlife

Stands of this community type provide excellent thermal and hiding cover for many species of wildlife. *Salix exigua* (sandbar willow) is normally not as heavily browsed as other willow species. Beaver tends to heavily utilize *Salix exigua* (sandbar willow).

Fisheries

The *Salix exigua* (sandbar willow) community type typically provides only limited overhanging shade due to its upright growth habit. The importance of willows to streambank protection for fisheries cannot be over emphasized. The herbaceous understory filters out sediments during high flows thereby contributing to streambank building. Some stands may be so dense as to hinder most recreational fishing.

Fire

The use of fire in this type as an improvement technique has been little studied. However, limited information indicates this type tends to sprout vigorously following fire. Quick, hot fires result in more sprouts than slower fires, which are potentially more damaging to the willows and tend to result in fewer sprouts.

Soil Management and Rehabilitation Opportunities

Soil compaction is usually not a problem on coarse textured soils and substrates. Fine textured soils are subject to compaction when moist. Unlike most other willows, *Salix exigua* (sandbar willow) can send up individual stems from a complex underground root system, making it an excellent woody species for stabilizing streambanks. Woody species provide the greatest amount of streambank protection. Herbaceous species rarely afford sufficient stream bank protection. Management should emphasize willows in protecting the streambank.

Salix exigua (sandbar willow) is a pioneering species commonly located along irrigation ditches, cutbanks, and wet areas adjacent to roads. It has an excellent capability to rapidly colonize and spread on disturbed areas, making it useful in streambank stabilization and revegetation projects at low to mid elevations. Once *Salix exigua* (sandbar willow) has stabilized soils on a site, other shrub and herbaceous species can become established. Because of this characteristic, it would be wise for land managers to maintain these stands. Once degradation occurs, rapid erosion of the streambank can occur with devastating results.

Salix exigua (sandbar willow) is highly adapted to most forms of disturbance. It is a prolific sprouter and, provided it has not been totally removed from the site, it will reestablish itself following release from heavy grazing pressure.

Degraded sites or exposed sand/gravel bars can be revegetated using *Salix exigua* (sandbar willow). Cuttings should be rooted and grown in a nursery to best insure survival. *Salix exigua* (sandbar willow) will produce an abundance of roots along the entire cut stem. Cuttings are best taken in spring, from two to four year old dormant wood. Cuttings 30-50 cm (12-20 in) long and >1 cm (0.5

in) in diameter produce best results. Shoots from cuttings can be expected to appear 10 days after planting.

Recreational Uses and Considerations

Recreational opportunities in *Salix exigua* (sandbar willow) stands are limited because of dense thickets and large mosquito populations. These areas are frequently flooded, making necessary additional consideration when planning roads, campsites, or any activities involving permanent or semi-permanent investments.

OTHER STUDIES

The *Salix exigua* (sandbar willow) community type is described by Hansen and others (1995) for Montana. Similar community types have been described by Norton and others (1981; Greys River, Wyoming), Mutz and Queiroz (1983; southeastern Idaho), Tuhy and Jensen (1982; central Idaho), Youngblood and others (1985b; eastern Idaho and western Wyoming), Padgett and others (1989; Utah and southeastern Idaho), and Chadde and others (1988; northern Yellowstone National Park). Undergrowth composition described by these authors varied widely, but it was often composed of introduced grasses such as *Agrostis stolonifera* (redtop), *Poa palustris* (fowl bluegrass), and *Poa pratensis* (Kentucky bluegrass).

Salix lutea/Cornus stolonifera Habitat Type

(Yellow Willow/Red-osier Dogwood Habitat Type)

SALILUT/CORNSTO

Number of Stands Sampled = 23

Number of Stands Sampled in Saskatchewan = 5

LOCATION AND ASSOCIATED LANDFORMS

The *Salix lutea/Cornus stolonifera* (yellow willow/red-osier dogwood) habitat type is a minor type in the Mixedgrass and Moist Mixedgrass Subregions of southwestern Saskatchewan on lotic (stream floodplain) systems. It can be found as dense bands parallel to the channel on the lower floodplain terraces of major rivers in the region.

VEGETATION

The *Salix lutea/Cornus stolonifera* (yellow willow/red-osier dogwood) habitat type is a climax community dominated by *Salix lutea* (yellow willow) in the tallest layer and *Cornus stolonifera* (red-osier dogwood) in a moist, tall shrub understory (Table 29).

Table 29. Average canopy cover, range of canopy cover, and constancy for species recorded in 7 late seral to climax stands of the *Salix lutea/Cornus stolonifera* (yellow willow/red-osier dogwood) habitat type

TABLE 29.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Trees			
Populus deltoides (plains cottonwood)	3	0-3	29
Shrubs			
Alnus tenuifolia (river alder)	10	0-10	14
Amelanchier alnifolia (Saskatoon)	3	0-3	14
Cornus stolonifera (red-osier dogwood)	34	10-70	100
Prunus virginiana (choke cherry)	1	0-1	29
Ribes aureum (golden currant)	1	0-1	14

TABLE 29.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Ribes hudsonianum (northern black currant)	3	0-3	14
Ribes oxyacanthoides (northern gooseberry)	1	0-3	71
Rosa woodsii (common wild rose)	1	0-1	14
Rosa spp. (rose)	14	0-30	71
Rubus idaeus (wild red raspberry)	3	0-3	14
Rubus pubescens (dewberry)	3	0-3	14
Salix bebbiana (beaked willow)	3	0-3	14
Salix exigua (sandbar willow)	6	0-10	57
Salix lutea (yellow willow)	59	30-80	100
Shepherdia argentea (thorny buffaloberry)	3	0-3	14
Symphoricarpos occidentalis (buckbrush)	6	0-10	57
Graminoids			
Agropyron dasystachyum (northern wheat grass)	30	0-30	14
Agropyron smithii (western wheat grass)	10	0-10	14
Agropyron trachycaulum (slender wheat grass)	3	0-3	14
Bromus inermis (awnless brome)	7	0-10	29
Carex sprengelii (Sprengel's sedge)	20	0-20	14
Deschampsia cespitosa (tufted hair grass)	3	0-3	14
Hordeum jubatum (foxtail barley)	3	0-3	14
Phalaris arundinacea (reed canary grass)	1	0-1	14
Poa palustris (fowl bluegrass)	3	0-3	14
Poa pratensis (Kentucky bluegrass)	3	0-3	14
Poa spp. (bluegrass)	3	0-3	14
Polypogon monspeliensis (rabbitfoot grass)	1	0-1	14
Sphenopholis intermedia (slender wedge grass)	10	0-10	14
Forbs			
Actaea rubra (red and white baneberry)	1	0-1	14
Anemone cylindrica (long-fruited anemone)	3	0-3	14
Apocynum spp. (dogbane)	10	0-10	14
Aralia nudicaulis (wild sarsaparilla)	10	0-10	14
Arctium minus (common burdock)	1	0-1	14
Cirsium arvense (Canada thistle)	4	0-10	43
Galium boreale (northern bedstraw)	20	0-20	14
Galium triflorum (sweet-scented bedstraw)	3	0-3	14
Glycyrrhiza lepidota (wild licorice)	1	0-1	14
Helianthus nuttallii (common tall sunflower)	1	0-1	14
Lysimachia ciliata (fringed loosestrife)	1	0-1	14
Mentha arvensis (wild mint)	2	0-3	29
Mentha spp. (mint)	3	0-3	14
Potentilla anserina (silverweed)	1	0-1	14
Scutellaria galericulata (marsh skullcap)	10	0-10	14
Smilacina stellata (star-flowered Solomon's-seal)	2	0-3	86
Solidago canadensis (Canada goldenrod)	5	0-10	29
Solidago spp. (goldenrod)	3	0-3	29
Solidago gigantea (late goldenrod)	1	0-1	14
Sonchus asper (prickly annual sow-thistle)	10	0-10	14
Stellaria crassifolia (fleshy stitchwort)	3	0-3	14
Taraxacum officinale (common dandelion)	1	0-1	14
Thalictrum spp. (meadow rue)	1	0-1	14
Urtica dioica (common nettle)	3	0-3	14
Vicia americana (wild vetch)	1	0-1	14
Viola canadensis (western Canada violet)	30	0-30	14
Sphagnum spp. (sphagnum mosses)	60	0-60	14
Ferns and Allies			
Equisetum arvense (common horsetail)	1	0-1	29

SUCCESSIONAL INFORMATION

The *Salix lutea/Cornus stolonifera* (yellow willow/red-osier dogwood) habitat type typically pioneers fresh, moist alluvial sites either with or without the presence of *Salix exigua* (sandbar willow) accompanying. With prolonged moderate to heavy grazing pressure, the *Salix lutea* (yellow willow) will lose its tall/moist shrub understory to a more diverse set of shorter/drier shrub species and disturbance-increaser herbaceous species such as *Poa pratensis* (Kentucky bluegrass), *Bromus inermis* (awnless brome), *Cirsium arvense* (Canada thistle), and *Glycyrrhiza lepidota* (wild licorice) (Table 30). This disturbance has the effect of drying out the site and may result in altering the site to the grazing disclimax *Salix lutea* (yellow willow) community type.

Table 30. Average canopy cover, range of canopy cover, and constancy for species recorded in 16 early seral or disturbed stands of the *Salix lutea/Cornus stolonifera* (yellow willow/red-osier dogwood) habitat type

TABLE 30.	**% Can. Cov.**		
Species	**Avg.**	**Rng.**	**Con.**
Trees			
Fraxinus pennsylvanica (green ash)	1	0-1	6
Populus angustifolia (narrow-leaf cottonwood)	3	0-3	6
Populus balsamifera (balsam poplar)	2	0-3	25
Populus deltoides (plains cottonwood)	1	0-1	6
Populus tremuloides (aspen)	3	0-3	6
Shrubs			
Alnus tenuifolia (river alder)	17	0-30	13
Amelanchier alnifolia (Saskatoon)	8	0-20	38
Betula occidentalis (water birch)	60	0-60	6
Clematis ligusticifolia (western clematis)	12	0-20	13
Cornus stolonifera (red-osier dogwood)	18	3-40	100
Elaeagnus commutata (silverberry)	1	0-3	31
Lonicera dioica (twining honeysuckle)	1	0-1	6
Lonicera involucrata (bracted honeysuckle)	3	0-3	13
Lonicera utahensis (red twinberry)	3	0-3	6
Prunus virginiana (choke cherry)	4	0-10	19
Ribes aureum (golden currant)	10	0-10	6
Ribes oxyacanthoides (northern gooseberry)	2	0-3	25
Rosa spp. (rose)	11	0-40	81
Rubus idaeus (wild red raspberry)	3	0-3	6
Salix candida (hoary willow)	3	0-3	6
Salix drummondiana (Drummond's willow)	3	0-3	6
Salix exigua (sandbar willow)	22	0-50	63
Salix lucida (shining willow)	3	0-3	6
Salix lutea (yellow willow)	27	10-60	100
Salix petiolaris (basket willow)	10	0-10	6
Salix planifolia (flat-leaved willow)	30	0-30	6
Salix pseudomonticola (false mountain willow)	3	0-3	6
Shepherdia argentea (thorny buffaloberry)	4	0-10	19
Symphoricarpos occidentalis (buckbrush)	16	0-20	63
Graminoids			
Agropyron dasystachyum (northern wheat grass)	3	0-3	6
Agrostis exarata (spike redtop)	1	0-1	6
Agropyron repens (quack grass)	4	0-10	25
Agrostis stolonifera (redtop)	20	0-20	6
Agropyron trachycaulum (slender wheat grass)	5	0-10	13
Bromus inermis (awnless brome)	33	0-70	63
Calamagrostis canadensis (bluejoint)	3	0-3	19
Carex praegracilis (graceful sedge)	1	0-1	6
Deschampsia cespitosa (tufted hair grass)	1	0-1	6
Elymus virginicus (Virginia wild rye)	1	0-1	6
Glyceria grandis (common tall manna grass)	1	0-1	6
Unknown Grass	3	0-3	6
Juncus balticus (wire rush)	13	0-20	19
Phalaris arundinacea (reed canary grass)	3	0-3	6
Poa palustris (fowl bluegrass)	2	0-3	31
Poa pratensis (Kentucky bluegrass)	6	0-20	44
Forbs			
Actaea rubra (red and white baneberry)	1	0-1	6
Apocynum spp. (dogbane)	1	0-1	6
Aralia nudicaulis (wild sarsaparilla)	2	0-3	13
Arctium minus (common burdock)	3	0-3	13
Aster borealis (marsh aster)	1	0-1	13
Chenopodium fremontii (Fremont's goosefoot)	3	0-3	6
Cicuta maculata (water-hemlock)	2	0-3	13
Cirsium arvense (Canada thistle)	4	0-10	44
Cirsium spp. (thistle)	1	0-1	6
Disporum trachycarpum (fairybells)	1	0-1	6
Epilobium angustifolium (common fireweed)	1	0-1	6

TABLE 30.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Unknown Forb	3	0-3	6
Fragaria virginiana (wild strawberry)	1	0-1	6
Geranium richardsonii (wild white geranium)	2	0-3	19
Glycyrrhiza lepidota (wild licorice)	3	0-10	50
Hackelia americana (nodding stickseed)	1	0-1	6
Helianthus nuttallii (common tall sunflower)	1	0-1	6
Heracleum lanatum (cow parsnip)	1	0-1	6
Lysimachia ciliata (fringed loosestrife)	10	0-10	6
Melilotus alba (white sweet-clover)	2	0-3	13
Melilotus officinalis (yellow sweet-clover)	3	0-3	6
Petasites palmatus (palmate-leaved coltsfoot)	3	0-3	6
Polygonum coccineum (water smartweed)	1	0-1	6
Potentilla anserina (silverweed)	1	0-1	6
Pyrola asarifolia (common pink wintergreen)	3	0-3	6
Sisymbrium loeselii (tall hedge mustard)	1	0-1	6
Smilacina stellata (star-flowered Solomon's-seal)	4	0-10	44
Solidago canadensis (Canada goldenrod)	2	0-3	25
Solidago spp. (goldenrod)	5	0-10	31
Solidago gigantea (late goldenrod)	7	0-10	13
Sonchus arvensis (perennial sow-thistle)	2	0-3	13
Sonchus spp. (sow-thistle)	2	0-3	19
Stachys palustris (marsh hedge-nettle)	1	0-1	6
Tanacetum vulgare (common tansy)	10	0-10	6
Taraxacum officinale (common dandelion)	1	0-1	6
Thalictrum venulosum (veiny meadow rue)	2	0-3	13
Trifolium spp. (clover)	1	0-1	6
Urtica dioica (common nettle)	20	0-20	6
Vicia americana (wild vetch)	5	0-20	44
Viola adunca (early blue violet)	1	0-1	6
Viola canadensis (western Canada violet)	1	0-1	6
Ferns and Allies			
Equisetum arvense (common horsetail)	3	0-10	31

SOILS

Soils are commonly dark brown to black Chernozems, but can intergrade to soils of the Organic order under conditions favorable for organic matter accumulation. Soil texture varies little from clay loam to sandy loam. Water tables are usually within 1 m (39 in) of the soil surface throughout summer. Redoximorphic features (mottles or gleyed soil) are also common within 1 m (39 in) of the soil surface. Estimated available water ranges from low to high.

ADJACENT COMMUNITIES

Adjacent wetter sites may be dominated by the *Salix exigua* (sandbar willow) community type, *Carex* species (sedge), the *Eleocharis palustris* (creeping spike-rush) habitat type, or open water. Drier sites may support a variety of types including the *Populus deltoides* (plains cottonwood) dominated community types, or the *Symphoricarpos occidentalis* (buckbrush) community type.

MANAGEMENT INFORMATION

Livestock

Stands of the *Salix lutea/Cornus stolonifera* (yellow willow/red-osier dogwood) habitat type provide moderate to high forage production, depending on the density of the shrubs. Palatability of the various species associated with this type is often high. Livestock will browse the young willow shoots; and, combined with trampling and soil compaction, they can alter the age structure and vegetation composition of this type.

Cornus stolonifera (red-osier dogwood) is considered an "ice cream" plant by livestock and wildlife. Its abundance, and growth form is a direct indication of past and current use levels. Overuse by livestock will reduce vigour of the willows, as indicated by highlined or clubbed growth forms and dead clumps. With continued overuse, willows can show a sharp decline in vigour, and they may eventually be eliminated from the site.

Frisina (1991) states that for a grazing program to be successful, it must meet the basic biological requirements of the plants present. These are photosynthesis, food storage, reproduction, and seedling establishment. In order to meet these requirements, long periods of rest are needed. It is during the long growing season rest periods that these essential biological processes of food production and storage, reproduction, and seedling establishment occur. In some instances, additional periods of rest may be required to improve or maintain a plant community.

Wildlife

The *Salix lutea/Cornus stolonifera* (yellow willow/red-osier dogwood) habitat type provides important hiding and nesting sites for songbirds and waterfowl, as well as browse, cover, and thermal protection for many species of wildlife. Beaver also heavily utilize *Salix lutea* (yellow willow).

Fisheries

The importance of willows in streambank stabilization, cover, and thermal protection for fisheries cannot be over emphasized. The herbaceous understory aids in filtering out sediments during overbank flows, thereby contributing to streambank building.

Fire

Salix lutea (yellow willow) will sprout vigorously following fire, especially in wetter stands. Quick, hot fires result in more sprouts than slower fires, which tend to be more damaging to willows, and to result in fewer sprouts (USDA IFSL 1995). After burning, the site should be protected from livestock grazing for at least 2 to 3 years to avoid damaging the young, palatable regrowth.

Soil Management and Rehabilitation Opportunities

The *Salix lutea/Cornus stolonifera* (yellow willow/red-osier dogwood) habitat type receives high use by wildlife and cattle. Soils and streambanks are susceptible to trampling damage, especially when soils are fine textured or wet. Deferring grazing until sites are drier can reduce trampling and compaction problems (Marlow 1984).

Salix lutea (yellow willow) is valuable for revegetating streambanks. Cuttings are best taken in the spring, from dormant two to four year old wood. Cuttings 30-50 cm (12-20 in) long and more than 1 cm (0.5 in) in diameter produce the best results, with the cuttings rooting freely along the entire length of the stem. Shoots from cuttings can be expected to appear 10-20 days after planting. However, use of rooted cuttings and nursery grown stock will produce better results.

OTHER STUDIES

The *Salix lutea/Cornus stolonifera* (yellow willow/red-osier dogwood) habitat type has not been described by others. Hansen and others (1995) describe a *Salix lutea/Carex rostrata* (yellow willow/beaked sedge) habitat type and a *Salix lutea/Calamagrostis canadensis* (yellow willow/bluejoint) habitat type for similar landscape locations in eastern and central Montana.

Salix lutea Community Type
(Yellow Willow Community Type)

SALILUT
Number of Stands Sampled = 10
Number of Stands Sampled in Saskatchewan = 0

LOCATION AND ASSOCIATED LANDFORMS

The *Salix lutea* (yellow willow) community type is a minor type at mid to low elevations in the Mixedgrass and Moist Mixedgrass Subregions of southwestern Saskatchewan. This type occupies stream and river edges, seeps, and moist alluvial terraces.

VEGETATION

The *Salix lutea* (yellow willow) community type represents a browsing/grazing disclimax where the natural understory of palatable shrubs has been eliminated by overgrazing. *Salix lutea* (yellow willow) is the major shrub species of this type, with some *Salix exigua* (sandbar willow) often present. Other shrubs likely present are *Rosa* species (rose) and *Symphoricarpos occidentalis* (buckbrush). The herbaceous understory is likely to include *Poa pratensis* (Kentucky bluegrass), *Cirsium arvense* (Canada thistle), and *Solidago canadensis* (Canada goldenrod) (Table 31).

Table 31. Average canopy cover, range of canopy cover, and constancy for species recorded in 10 sampled stands of the *Salix lutea* (yellow willow) community type

TABLE 31.	**% Can. Cov.**		
Species	**Avg.**	**Rng.**	**Con.**
Trees			
Populus balsamifera (balsam poplar)	1	0-3	30
Populus tremuloides (aspen)	1	0-1	10
Shrubs			
Alnus tenuifolia (river alder)	3	0-3	20
Amelanchier alnifolia (Saskatoon)	10	0-10	10
Clematis ligusticifolia (western clematis)	1	0-1	10
Cornus stolonifera (red-osier dogwood)	1	0-1	20
Elaeagnus commutata (silverberry)	11	0-30	30
Prunus virginiana (choke cherry)	1	0-1	20
Ribes oxyacanthoides (northern gooseberry)	2	0-3	20
Rosa spp. (rose)	14	0-40	50
Salix bebbiana (beaked willow)	10	0-10	10
Salix exigua (sandbar willow)	35	0-90	70
Salix lucida (shining willow)	17	0-20	30
Salix lutea (yellow willow)	37	10-80	100
Salix myrtillifolia (myrtle-leaved willow)	1	0-1	10
Salix planifolia (flat-leaved willow)	3	0-3	10
Symphoricarpos occidentalis (buckbrush)	10	0-20	40
Graminoids			
Agropyron dasystachyum (northern wheat grass)	3	0-3	10
Agropyron repens (quack grass)	1	0-1	10
Agrostis scabra (rough hair grass)	10	0-10	20
Agropyron smithii (western wheat grass)	1	0-1	10
Agrostis stolonifera (redtop)	10	0-20	30
Agropyron trachycaulum (slender wheat grass)	1	0-1	10
Beckmannia syzigachne (slough grass)	1	0-1	10
Bromus inermis (awnless brome)	7	0-10	20
Calamagrostis canadensis (bluejoint)	10	0-10	20
Carex crawfordii (Crawford's sedge)	3	0-3	10
Carex deweyana (Dewey's sedge)	1	0-1	10
Carex lanuginosa (woolly sedge)	1	0-1	10
Carex praegracilis (graceful sedge)	1	0-1	10
Cinna latifolia (drooping wood-reed)	1	0-1	10
Elymus canadensis (Canada wild rye)	1	0-1	30
Festuca pratensis (meadow fescue)	3	0-3	10
Hordeum jubatum (foxtail barley)	1	0-3	30
Juncus alpinoarticulatus (alpine rush)	1	0-1	10
Juncus balticus (wire rush)	2	0-3	30
Juncus nevadensis (Nevada rush)	3	0-3	10

TABLE 31.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Phalaris arundinacea (reed canary grass)	30	0-30	10
Phleum pratense (timothy)	3	0-3	10
Poa palustris (fowl bluegrass)	9	0-20	50
Poa pratensis (Kentucky bluegrass)	7	0-20	60
Scirpus microcarpus (small-fruited bulrush)	7	0-10	20
Scirpus paludosus (prairie bulrush)	3	0-3	10
Scirpus pungens (three-square rush)	1	0-1	10
Spartina pectinata (prairie cord grass)	3	0-3	10
Forbs			
Achillea millefolium (common yarrow)	1	0-1	10
Achillea sibirica (many-flowered yarrow)	1	0-1	10
Apocynum cannabinum (Indian hemp)	1	0-1	10
Apocynum spp. (dogbane)	1	0-1	10
Artemisia campestris (plains wormwood)	1	0-1	10
Aster ericoides (tufted white prairie aster)	1	0-1	10
Aster hesperius (western willow aster)	5	0-10	20
Aster spp. (aster)	1	0-1	10
Chrysosplenium iowense (golden saxifrage)	1	0-1	10
Chrysanthemum leucanthemum (ox-eye daisy)	1	0-1	10
Cirsium arvense (Canada thistle)	1	0-3	50
Epilobium ciliatum (northern willowherb)	10	0-10	10
Erigeron acris (northern daisy fleabane)	1	0-1	10
Galium boreale (northern bedstraw)	1	0-1	10
Geum macrophyllum (large-leaved yellow avens)	1	0-1	10
Glycyrrhiza lepidota (wild licorice)	2	0-3	40
Melilotus alba (white sweet-clover)	5	0-10	30
Melilotus officinalis (yellow sweet-clover)	1	0-1	20
Mentha arvensis (wild mint)	1	0-1	10
Pedicularis bracteosa (western lousewort)	1	0-1	10
Plantago major (common plantain)	4	0-10	30
Potentilla anserina (silverweed)	10	0-10	10
Smilacina stellata (star-flowered Solomon's-seal)	1	0-1	10
Solidago canadensis (Canada goldenrod)	1	0-3	60
Solidago spp. (goldenrod)	3	0-3	10
Sonchus asper (prickly annual sow-thistle)	1	0-1	10
Sonchus spp. (sow-thistle)	1	0-1	30
Taraxacum officinale (common dandelion)	2	0-3	20
Thalictrum occidentale (western meadow rue)	1	0-1	10
Thalictrum venulosum (veiny meadow rue)	1	0-1	10
Trifolium repens (white clover)	3	0-3	10
Vicia americana (wild vetch)	2	0-3	20
Vicia cracca (tufted vetch)	3	0-3	10
Ferns and Allies			
Equisetum arvense (common horsetail)	3	0-3	50
Equisetum hyemale (common scouring-rush)	1	0-1	10

SUCCESSIONAL INFORMATION

If browsing pressure is heavy, willow cover will decrease, resulting in communities that are more open. Heavy grazing pressure will cause a decrease in the more desirable grasses such as *Agropyron trachycaulum* (slender wheat grass) with a corresponding increase in introduced or less desirable species such as *Poa pratensis* (Kentucky bluegrass), *Bromus inermis* (awnless brome), or *Cirsium arvense* (Canada thistle).

SOILS

These soils are either Regosols or Chernozems ranging in texture from silt loam to clay, and are saturated early in spring, often remaining moist throughout the growing season.

ADJACENT COMMUNITIES

Adjacent wetter sites may be dominated by the *Salix exigua* (sandbar willow) community type, the *Juncus* *balticus* (wire rush) community type, or open water. Drier sites may support a variety of types including the *Populus deltoides* (plains cottonwood) dominated community types, the *Poa pratensis* (Kentucky bluegrass) community type, or the *Bromus inermis* (awnless brome) community type.

MANAGEMENT INFORMATION

Livestock

Because forage production is high, this type may be an important source of summer forage. Foliage is most palatable when young, but wet conditions early in the grazing season may limit use by livestock. Due to the high forage production and highly palatable grasses, many of these sites receive heavy summer and fall use, especially after uplands have been grazed or become dried. Under season-long grazing, grasses that are more desirable may be replaced by *Poa pratensis* (Kentucky bluegrass) or *Bromus inermis* (awnless brome). To maintain vigour and prevent damage to soils and vegetation, grazing should be deferred until soils dry and limited to levels ranging from light to moderate.

Overuse by livestock will result in a reduced vigour by the willows present, as indicated by highlining, clubbing, or dead willow clumps. With continued overuse, willows can show a sharp decline in vigour, and they may eventually be eliminated from the site.

To minimize undesired changes in community composition and structure, pasture management should be keyed on the forage available from, and physical conditions in, this type and stands of other riparian or wetland communities. Use of this concept (of the riparian or wetland pasture) has led to some success in maintaining or improving the health of riparian or wetland vegetation (Kinch 1987).

Frisina (1991) states that for a grazing program to be successful, it must meet the basic biological requirements of the plants present. These are photosynthesis, food storage, reproduction, and seedling establishment. In order to meet these requirements, long periods of rest are needed. It is during the long growing season rest periods that these essential biological processes of food production and storage, reproduction, and seedling establishment occur. In some instances, additional periods of rest may be required to improve or maintain a plant community.

Wildlife

Wild ungulates use this type for summer and winter forage. Winter elk use may be heavy (Gaffney 1941). Dense stands provide excellent thermal and hiding cover for many wildlife species.

Beaver perform a vital role in the health and maintenance of riparian ecosystems. Beaver dams assist in controlling the channel downcutting, bank erosion, and sediment loading (Gordon and others 1992). When beaver construct a dam, they raise the water table in the vicinity, providing water for hydrophytic species such as willows and sedges. The beaver dam also slows down flow of the water, which allows suspended sediment to be deposited behind the dam. The combined effect of sediment deposition and plant production is to create a wetland environment excellent for waterfowl and fish habitat. The policy of land managers has often been to trap and kill beaver. Beaver populations may require regulation, but because these animals produce such desirable habitat and provide so many beneficial stream functions, their removal from a riparian system should be considered carefully.

Fisheries

Where adjacent to streams, this type effectively stabilizes soils, forms overhanging canopies for shading the channel, and stabilizes undercut banks, enhancing fish habitat. The importance of willows in streambank protection, cover, and thermal protection for fisheries cannot be over emphasized. The herbaceous understory serves to filter sediments during high flows, thereby contributing to building of streambanks.

Fire

Prescribed burning in this type is an effective method of rejuvenating decadent clumps. The willow species most often present in this type sprout vigorously following fire, especially in wetter stands. Quick, hot fires result in more sprouts than slower fires, which tend to be more damaging to willows, and to result in fewer sprouts.

After burning, the site should be protected from livestock grazing for at least 2 to 3 years to avoid damaging the young, palatable regrowth.

Soil Management and Rehabilitation Opportunities

Soils on this type are easily damaged from trampling by livestock if grazed when moist. This disturbance often leads to compaction, streambank sloughing, damage to vegetation, and premature drying of the soil surface. Woody species provide the best streambank protection. Herbaceous species rarely afford sufficient stream bank protection to any but the smallest streams. Management should emphasize the importance of willows in protecting the streambank.

Salix lutea (yellow willow) is useful in streambank stabilization and revegetation projects (Platts and others 1987). Cuttings should be rooted and grown in a nursery to insure best chance for survival. *Salix lutea* (yellow willow) produces an abundance of roots, mostly along the lower one-third of the cut stem. Cuttings are best taken in the spring from two to four year old dormant wood. Cuttings 30-50 cm (12-20 in) long and >1 cm (0.5 in) in diameter produce best results. Shoots from cuttings can be expected to appear 10 days after planting.

Recreational Uses and Considerations

Recreational opportunities are limited because of the small size of these stands and the high density of *Salix lutea* (yellow willow). These areas are frequently flooded, making necessary additional consideration when planning roads, campsites, or any activities involving permanent or semi-permanent investments.

OTHER STUDIES

Hansen and others (1995) described a *Salix lutea/Carex rostrata* (yellow willow/beaked sedge) habitat type, a *Salix lutea/Calamagrostis canadensis* (yellow willow/bluejoint) habitat type, and a *Salix lutea* (yellow willow) community type. Youngblood and others (1985b) also identified a *Salix lutea* (yellow willow) community type in eastern Idaho and western Wyoming.

Salix petiolaris/Carex atherodes Habitat Type
(Basket Willow/Awned Sedge Habitat Type)

SALIPET/CAREATH
Number of Stands Sampled = 12
Number of Stands Sampled in Saskatchewan = 7

LOCATION AND ASSOCIATED LANDFORMS

The *Salix petiolaris/Carex atherodes* (basket willow/awned sedge) habitat type is a major type in the Aspen Parkland Ecoregion and an incidental type in the Moist Mixedgrass and Mixedgrass Ecoregions. It occurs around sloughs, depressional wetlands, wet meadows, and occasionally along streamsides.

VEGETATION

This type is dominated by a dense, closed canopy of *Salix petiolaris* (basket willow), which covers a sparse understory that includes *Carex atherodes* (awned sedge) (Table 32).

Table 32. Average canopy cover, range of canopy cover, and constancy for species recorded in 7 late seral to climax stands of the *Salix petiolaris/Carex atherodes* (basket willow/awned sedge) habitat type

TABLE 32.	**% Can. Cov.**		
Species	**Avg.**	**Rng.**	**Con.**
Shrubs			
Cornus stolonifera (red-osier dogwood)	2	0-3	29
Salix bebbiana (beaked willow)	3	0-3	14
Salix petiolaris (basket willow)	96	90-98	100
Graminoids			
Bromus inermis (awnless brome)	1	0-1	14
Carex atherodes (awned sedge)	24	3-60	100
Carex petasata (pasture sedge)	3	0-3	14
Carex rostrata (beaked sedge)	1	0-1	14
Unknown Grass	1	0-1	29
Phalaris arundinacea (reed canary grass)	1	0-1	14
Poa palustris (fowl bluegrass)	12	0-20	29
Forbs			
Aster hesperius (western willow aster)	1	0-1	14
Cirsium arvense (Canada thistle)	1	0-1	43
Geum macrophyllum (large-leaved yellow avens)	1	0-1	14
Mentha arvensis (wild mint)	2	0-3	29
Polygonum amphibium (water smartweed)	3	0-3	14
Potentilla norvegica (rough cinquefoil)	1	0-1	14
Rumex occidentalis (western dock)	1	0-1	14
Scutellaria galericulata (marsh skullcap)	1	0-1	14
Sonchus arvensis (perennial sow-thistle)	3	0-3	29

SUCCESSIONAL INFORMATION

The *Salix petiolaris/Carex atherodes* (basket willow/awned sedge) habitat type is a very densely growing community of many-stemmed, fast growing, and short-lived willows. Undisturbed older stands of *Salix petiolaris* (basket willow) have about equal components of dead stems and young replacement stems. *Salix petiolaris* (basket willow) is a pioneer species able to colonize suitable sites and perpetuate a stand as long as conditions remain suitable. The clonal nature of these stands allows them to shift topographic position in response to slow changes in moisture regime, such as the gradual filling of a slough during its evolutionary process.

Livestock and wild ungulates readily browse these stands, but have difficulty penetrating them. Therefore, disturbance by these agents is generally limited to the outside edge of the stand. This peripheral disturbance has the effect of opening up the edge to encroachment by disturbance-related species such as *Rosa* species (rose), *Agrostis stolonifera* (redtop), *Cirsium arvense* (Canada thistle), and *Sonchus arvensis* (perennial sow-thistle) (Table 33). Ultimately, continued severe browsing pressure will open the stand and replace the *Carex atherodes* (awned sedge) with the disturbance-related, and drier, herbaceous species. When this happens, the site has changed to the grazing disclimax *Salix petiolaris* (basket willow) community type.

Table 33. Average canopy cover, range of canopy cover, and constancy for species recorded in 5 early seral or disturbed stands of the *Salix petiolaris/Carex atherodes* (basket willow/awned sedge) habitat type

TABLE 33.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Shrubs			
Betula glandulosa (bog birch)	2	0-3	40
Cornus stolonifera (red-osier dogwood)	15	0-20	40
Ribes oxyacanthoides (northern gooseberry)	2	0-3	40
Ribes spp. (currant)	1	0-1	20
Rosa spp. (rose)	4	0-10	60
Rubus arcticus (dwarf raspberry)	3	0-3	20
Salix bebbiana (beaked willow)	3	0-3	20
Salix lutea (yellow willow)	1	0-1	20
Salix petiolaris (basket willow)	81	50-98	100
Salix planifolia (flat-leaved willow)	3	0-3	40
Symphoricarpos occidentalis (buckbrush)	3	0-3	20
Graminoids			
Agropyron smithii (western wheat grass)	1	0-1	20
Agrostis stolonifera (redtop)	5	0-10	60
Alopecurus occidentalis (alpine foxtail)	10	0-10	20
Bromus inermis (awnless brome)	20	0-20	20
Carex aquatilis (water sedge)	10	0-10	20
Carex atherodes (awned sedge)	18	0-40	60
Carex prairea (prairie sedge)	20	0-20	20
Carex rostrata (beaked sedge)	7	0-10	40
Festuca saximontana (Rocky Mountain fescue)	3	0-3	20
Poa palustris (fowl bluegrass)	5	0-10	40
Poa pratensis (Kentucky bluegrass)	20	0-20	20
Scirpus paludosus (prairie bulrush)	1	0-1	20
Scolochloa festucacea (spangletop)	3	0-3	20
Forbs			
Achillea millefolium (common yarrow)	1	0-1	40
Anemone cylindrica (long-fruited anemone)	20	0-20	20
Artemisia biennis (biennial sagewort)	1	0-1	20
Aster spp. (aster)	10	0-10	20
Caltha palustris (marsh-marigold)	10	0-10	20
Cirsium arvense (Canada thistle)	3	0-3	60
Cynoglossum officinale (hound's-tongue)	3	0-3	20
Unknown Forb	1	0-1	20
Galium boreale (northern bedstraw)	2	0-3	40
Gentiana affinis (prairie gentian)	1	0-1	20
Geranium richardsonii (wild white geranium)	1	0-1	20
Geum macrophyllum (large-leaved yellow avens)	5	0-10	40
Lathyrus palustris (marsh vetchling)	1	0-1	20
Medicago lupulina (black medick)	1	0-1	20
Mentha arvensis (wild mint)	2	0-3	60
Polygonum amphibium (water smartweed)	1	0-1	40
Potentilla anserina (silverweed)	7	0-10	40
Rumex occidentalis (western dock)	3	0-3	20
Sium suave (water parsnip)	1	0-1	20
Sonchus arvensis (perennial sow-thistle)	18	0-40	60
Stachys palustris (marsh hedge-nettle)	1	0-1	20
Stellaria calycantha (northern stitchwort)	1	0-1	20
Taraxacum officinale (common dandelion)	1	0-3	60
Thalictrum venulosum (veiny meadow rue)	1	0-1	20
Vicia americana (wild vetch)	1	0-1	40
Unknown Moss (moss)	10	0-10	20

SOILS

Soils are commonly dark brown to black Chernozems, but can intergrade to soils of the Organic order under conditions favorable for organic matter accumulation. Soil textures vary from clay loam to sandy loam. Water tables are usually within 1 m (39 in) of the soil surface throughout summer. Redoximorphic features (mottles or gleyed soil) are common within 1 m (39 in) of the soil surface on sites of this type.

ADJACENT COMMUNITIES

Adjacent wetter sites may support either the *Carex atherodes* (awned sedge) habitat type or the *Polygonum coccineum* (water smartweed) community types, or be open water. Adjacent drier sites may support the *Populus tremuloides/Cornus stolonifera* (aspen/red-osier dogwood) habitat type or the *Salix petiolaris* (basket willow) community type. Other communities on drier sites may include the *Bromus inermis* (awnless brome) community type, the *Agrostis stolonifera* (redtop) community type, or developed agricultural land.

MANAGEMENT INFORMATION

Livestock

The *Salix petiolaris/Carex atherodes* (basket willow/awned sedge) habitat type does not provide substantial herbaceous forage value for livestock due to the dense, closed nature of the stands. Livestock will browse the willows, but prolonged use will ultimately damage the community by reducing the willow cover and altering the understory composition by introducing disturbance-related species.

Wildlife

These dense willow communities, associated with *Carex* (sedge) meadows and topographical depressions, provide browse and good thermal and hiding cover for many wildlife species, usually in a beneficial mosaic pattern, within a landscape often already greatly altered by agricultural development.

Fisheries

The *Salix petiolaris/Carex atherodes* (basket willow/awned sedge) habitat type does not occur often in landscape positions that have much bearing on fisheries. When any willow species occupies a streambank position, it should be protected and promoted. The importance of willows in streambank stabilization, cover, and thermal protection for fisheries cannot be over emphasized.

Fire

We know little about the response of *Salix petiolaris* (basket willow) to being burned, but suspect that, like most willow species, it readily sprouts from the root crown after fire that is not extremely hot.

Soil Management and Rehabilitation Opportunities

Salix petiolaris (basket willow) is readily propagated through cuttings (Plants for a Future 1999), therefore is adaptable to rehabilitating suitable degraded sites where woody plants have been removed, but the water table remains high.

OTHER STUDIES

The *Salix petiolaris/Carex atherodes* (basket willow/awned sedge) habitat type has not been described by others.

Salix petiolaris/Cornus stolonifera Habitat Type
(Basket Willow/Red-osier Dogwood Habitat Type)

SALIPET/CORNSTO
Number of Stands Sampled = 10
Number of Stands Sampled in Alberta = 5

LOCATION AND ASSOCIATED LANDFORMS

The *Salix petiolaris/Cornus stolonifera* (basket willow/red-osier dogwood) habitat type is a minor type in the Aspen Parkland Ecoregion and an incidental type in the Mixedgrass and Moist Mixedgrass Ecoregions. It occurs around sloughs, depressional wetlands, and wet meadows, typically in a fairly narrow band, or ring, between the wetter *Salix petiolaris/Carex atherodes* (basket willow/awned sedge) habitat type and the drier *Populus tremuloides/Cornus stolonifera* (aspen/red-osier dogwood) community type. This type once occupied far more sites before the Parkland Ecoregion became developed agriculturally.

VEGETATION

The *Salix petiolaris/Cornus stolonifera* (basket willow/red-osier dogwood) habitat type is often adjacent to and above the slightly wetter *Salix petiolaris/Carex atherodes* (basket willow/awned sedge) habitat type. It has a slightly less dense canopy of *Salix petiolaris* (basket willow) and significantly more cover of other shrub species. In an undisturbed state this type is dominated by a dense canopy of *Salix petiolaris* (basket willow) with *Cornus stolonifera* (red-osier dogwood) and/or other willow species (Table 34). *Salix petiolaris* (basket willow) stands occupy the wettest sites that support shrub growth around slough and pothole wetlands.

Table 34. Average canopy cover, range of canopy cover, and constancy for species recorded in 3 late seral to climax stands of the *Salix petiolaris/Cornus stolonifera* (basket willow/red-osier dogwood) habitat type

TABLE 34.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Shrubs			
Cornus stolonifera (red-osier dogwood)	35	0-50	67
Ribes oxyacanthoides (northern gooseberry)	1	0-1	33
Rosa spp. (rose)	1	0-1	33
Salix bebbiana (beaked willow)	3	0-3	67
Salix lutea (yellow willow)	3	0-3	33
Salix petiolaris (basket willow)	87	80-90	100
Symphoricarpos (occidentalisbuckbrush)	20	0-20	33
Graminoids			
Bromus inermis (awnless brome)	3	0-3	67
Carex atherodes (awned sedge)	2	0-3	67
Carex sychnocephala (long-beaked sedge)	3	0-3	33
Poa palustris (fowl bluegrass)	1	0-1	33
Forbs			
Arnica chamissonis (leafy arnica)	3	0-3	33
Epilobium angustifolium (common fireweed)	1	0-1	33
Epilobium ciliatum (northern willowherb)	1	0-1	33
Unknown Forb	1	0-1	33
Fragaria virginiana (wild strawberry)	1	0-1	33
Galium triflorum (sweet-scented bedstraw)	1	0-1	33
Mentha arvensis (wild mint)	1	0-1	33
Sonchus spp. (sow-thistle)	2	0-3	67
Urtica dioica (common nettle)	1	0-1	33

SUCCESSIONAL INFORMATION

The *Salix petiolaris/Cornus stolonifera* (basket willow/red-osier dogwood) habitat type is a densely growing community of many-stemmed, fast growing, and short-lived willows and other shrubs—mostly *Cornus stolonifera* (red-osier dogwood). Undisturbed older stands of *Salix petiolaris* (basket willow) have about equal components of dead stems and young replacement stems. *Salix petiolaris* (basket willow) is a pioneer species able to colonize suitable sites and perpetuate a stand as long as conditions remain suitable. The clonal nature of these stands allows them to shift topographic position in response to slow changes in moisture regime, such as the gradual filling of a slough during its evolutionary process.

Livestock and wild ungulates readily browse these stands, having the effect of increasing disturbance-related species such as *Rosa* species (rose), *Symphoricarpos occidentalis* (buckbrush), *Bromus inermis* (awnless brome), *Cirsium arvense* (Canada thistle), and *Solidago canadensis* (Canada goldenrod) (Table 35).

The soils of the Parkland Ecoregion uplands are extremely valuable for farming, therefore many of the sloughs, with their associated woody vegetation, have been unaffected by grazing. The greatest effects on these sites from surrounding agricultural practice is drainage and clearing for tillage, increased sedimentation, and accelerated accumulation of agricultural chemicals from the adjacent farmed land.

Table 35. Average canopy cover, range of canopy cover, and constancy for species recorded in 7 early seral or disturbed stands of the *Salix petiolaris/Cornus stolonifera* (basket willow/red-osier dogwood) habitat type

TABLE 35.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Trees			
Betula papyrifera (white birch)	1	0-1	14
Picea glauca (white spruce)	1	0-1	14
Populus balsamifera (balsam poplar)	1	0-1	14
Shrubs			
Amelanchier alnifolia (Saskatoon)	3	0-3	14
Betula occidentalis (water birch)	1	0-1	14
Clematis occidentalis (purple clematis)	3	0-3	14
Cornus stolonifera (red-osier dogwood)	31	0-60	43
Elaeagnus commutata (silverberry)	3	0-3	14
Prunus virginiana (choke cherry)	1	0-1	14
Ribes oxyacanthoides (northern gooseberry)	3	0-3	29
Rosa spp. (rose)	19	0-70	71
Rubus idaeus (wild red raspberry)	15	0-30	29
Salix bebbiana (beaked willow)	3	0-3	29
Salix exigua (sandbar willow)	35	0-60	29
Salix petiolaris (basket willow)	70	20-98	100
Salix planifolia (flat-leaved willow)	2	0-3	29
Symphoricarpos occidentalis (buckbrush)	9	0-30	57
Graminoids			
Agropyron smithii (western wheat grass)	1	0-1	14
Agrostis stolonifera (redtop)	15	0-20	29
Agropyron trachycaulum (slender wheat grass)	10	0-10	14
Bromus inermis (awnless brome)	38	0-90	86
Calamagrostis canadensis (bluejoint)	10	0-10	14
Carex bebbii (Bebb's sedge)	1	0-1	14
Carex praegracilis (graceful sedge)	1	0-1	14
Carex sprengelii (Sprengel's sedge)	1	0-1	14
Glyceria striata (fowl manna grass)	1	0-1	14
Hordeum jubatum (foxtail barley)	1	0-1	14
Phleum pratense (timothy)	10	0-10	14
Poa palustris (fowl bluegrass)	15	0-20	29
Poa pratensis (Kentucky bluegrass)	25	0-30	29
Forbs			
Achillea millefolium (common yarrow)	3	0-3	14
Anthemis cotula (mayweed)	3	0-3	14
Apocynum cannabinum (Indian hemp)	1	0-1	14
Aster ciliolatus (Lindley's aster)	3	0-3	14
Cirsium arvense (Canada thistle)	2	0-3	43
Delphinium glaucum (tall larkspur)	1	0-1	14
Epilobium angustifolium (common fireweed)	3	0-3	14
Fragaria virginiana (wild strawberry)	3	0-3	14
Galium boreale (northern bedstraw)	1	0-1	14
Geum aleppicum (yellow avens)	3	0-3	29
Glycyrrhiza lepidota (wild licorice)	12	0-20	29
Heracleum lanatum (cow parsnip)	3	0-3	14
Hieracium umbellatum (narrow-leaved hawkweed)	3	0-3	14
Melilotus alba (white sweet-clover)	3	0-3	14
Polygonum coccineum (water smartweed)	10	0-10	14
Polygonum lapathifolium (pale persicaria)	3	0-3	14
Potentilla gracilis (graceful cinquefoil)	3	0-3	14
Potentilla norvegica (rough cinquefoil)	1	0-1	14
Potentilla palustris (marsh cinquefoil)	1	0-1	14
Rumex occidentalis (western dock)	2	0-3	29

TABLE 35.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Smilacina stellata (star-flowered Solomon's-seal)	1	0-1	43
Solidago canadensis (Canada goldenrod)	5	0-10	71
Sonchus arvensis (perennial sow-thistle)	10	0-20	29
Sonchus spp. (sow-thistle)	10	0-10	14
Stellaria longifolia (long-leaved chickweed)	1	0-1	14
Taraxacum officinale (common dandelion)	2	0-3	29
Thalictrum venulosum (veiny meadow rue)	7	0-10	43
Thermopsis rhombifolia (golden bean)	1	0-1	14
Urtica dioica (common nettle)	1	0-1	14
Vicia americana (wild vetch)	1	0-1	29
Ferns and Allies			
Equisetum arvense (common horsetail)	1	0-1	29

SOILS

Soils are commonly dark brown to black Chernozems, but can intergrade to soils of the Organic order under conditions favorable for organic matter accumulation. Soil textures vary from clay loam to sandy loam. Water tables are usually within 1 m (39 in) of the soil surface throughout summer. Redoximorphic features (mottles or gleyed soil) are common within 1 m (39 in) of the soil surface on sites of this type.

ADJACENT COMMUNITIES

Adjacent wetter sites may support the *Salix petiolaris/Carex atherodes* (basket willow/awned sedge) habitat type, the *Carex atherodes* (awned sedge) habitat type, any of several emergent herbaceous types, or be open water. Adjacent drier sites may support the *Populus tremuloides/Cornus stolonifera* (aspen/red-osier dogwood) community type, the *Bromus inermis* (awnless brome) community type, the *Agrostis stolonifera* (redtop) community type, or be developed agricultural land.

MANAGEMENT INFORMATION

Livestock

The *Salix petiolaris/Cornus stolonifera* (basket willow/red-osier dogwood) habitat type does not provide substantial herbaceous forage value for livestock due to the dense, closed nature of the stands. Livestock will browse the shrubs, but prolonged use will ultimately damage the community by reducing the woody cover and introducing disturbance-related species.

Wildlife

These dense willow communities, associated with *Carex* (sedge) meadows and topographical depressions, provide browse and good thermal and hiding cover for many wildlife species, usually in a beneficial mosaic pattern, within a landscape often already greatly altered by agricultural development.

Fisheries

The *Salix petiolaris/Cornus stolonifera* (basket willow/red-osier dogwood) habitat type does not occur often in landscape positions that have much bearing on fisheries. When any willow species occupies a streambank position, it should be protected and promoted. The importance of willows in streambank stabilization, cover, and thermal protection for fisheries cannot be over emphasized.

Fire

At this date we know little about the response of *Salix petiolaris* (basket willow) to being burned, but suspect that, like most willow species, it readily sprouts from the rootstocks after fire that is not extremely hot.

Soil Management and Rehabilitation Opportunities

Salix petiolaris (basket willow) is readily propagated through cuttings (Plants for a Future 2000), therefore is adaptable to rehabilitating suitable degraded sites where woody plants have been removed, but the water table remains high.

OTHER STUDIES

The *Salix petiolaris/Cornus stolonifera* (basket willow/red-osier dogwood) habitat type has not been described by others.

Salix petiolaris Community Type
(Basket Willow Community Type)

SALIPET
Number of Stands Sampled = 5
Number of Stands Sampled in Saskatchewan = 3

LOCATION AND ASSOCIATED LANDFORMS

The *Salix petiolaris* (basket willow) community type represents a browsing/grazing disclimax where the natural understories of palatable shrubs and/or sedges have been eliminated by overgrazing. This is a major type in the Aspen Parkland Ecoregion and an incidental type in the Mixedgrass and Moist Mixedgrass Ecoregions. It occurs around sloughs, depressional wetlands, and wet meadows, typically in a fairly narrow band, or ring, between wetter emergent herbaceous types, such as the *Carex atherodes* (awned sedge) habitat type, and the drier *Populus tremuloides/Cornus stolonifera* (aspen/red-osier dogwood) community type. The frequency of occurrence on the landscape is greater than is indicated by the small sample.

VEGETATION

This type represents a disturbance-induced disclimax, usually from livestock grazing, on sites that would otherwise support the *Salix petiolaris/Carex atherodes* (basket willow/awned sedge) habitat type or the *Salix petiolaris/Cornus stolonifera* (basket willow/red-osier dogwood) habitat type. It is dominated by a canopy of *Salix petiolaris* (basket willow) that has been opened by disturbance, resulting in a reduction of the dense tall shrub canopy and in an increase in disturbance related increaser species, such as *Rosa* species (rose), *Bromus inermis* (awnless brome), *Cirsium arvense* (Canada thistle), and *Poa pratensis* (Kentucky bluegrass), and *Sonchus arvensis* (perennial sow-thistle) (Table 36).

Table 36. Average canopy cover, range of canopy cover, and constancy for species recorded in 5 sampled stands of the *Salix petiolaris* (basket willow) community type

TABLE 36.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Shrubs			
Amelanchier alnifolia (Saskatoon)	1	0-1	20
Betula occidentalis (water birch)	10	0-10	20
Cornus stolonifera (red-osier dogwood)	1	0-1	20
Elaeagnus commutata (silverberry)	3	0-3	20
Potentilla fruticosa (shrubby cinquefoil)	1	0-1	20
Ribes oxyacanthoides (northern gooseberry)	1	0-1	20
Rosa spp. (rose)	3	0-3	40
Salix bebbiana (beaked willow)	1	0-1	20
Salix petiolaris (basket willow)	73	30-98	100
Shepherdia argentea (thorny buffaloberry)	3	0-3	20
Symphoricarpos occidentalis (buckbrush)	30	0-30	20
Graminoids			
Agropyron dasystachyum (northern wheat grass)	1	0-1	20
Alopecurus aequalis (short-awned foxtail)	1	0-1	20
Bromus inermis (awnless brome)	31	0-70	60
Calamagrostis stricta (narrow reed grass)	1	0-1	20
Carex lanuginosa (woolly sedge)	20	0-30	40
Carex praegracilis (graceful sedge)	3	0-3	20
Carex scopulorum (Holn's Rocky Mountain sedge)	1	0-1	20
Carex sprengelii (Sprengel's sedge)	1	0-1	20
Deschampsia cespitosa (tufted hair grass)	3	0-3	20
Juncus balticus (wire rush)	30	0-30	40
Phleum pratense (timothy)	3	0-3	20
Phragmites australis (reed)	3	0-3	20
Poa palustris (fowl bluegrass)	3	0-3	20
Poa pratensis (Kentucky bluegrass)	15	0-20	40
Forbs			
Achillea millefolium (common yarrow)	1	0-1	20
Allium schoenoprasum (wild chives)	1	0-1	20
Arnica chamissonis (leafy arnica)	1	0-1	20

TABLE 36.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Aster borealis (marsh aster)	3	0-3	20
Aster hesperius (western willow aster)	1	0-1	20
Cirsium arvense (Canada thistle)	7	0-10	40
Epilobium spp. (willowherb)	1	0-1	20
Fragaria virginiana (wild strawberry)	1	0-1	20
Galium boreale (northern bedstraw)	1	0-1	20
Geum aleppicum (yellow avens)	1	0-1	20
Geum macrophyllum (large-leaved yellow avens)	1	0-1	20
Hieracium umbellatum (narrow-leaved hawkweed)	1	0-1	20
Lappula squarrosa (bluebur)	3	0-3	20
Melilotus alba (white sweet-clover)	10	0-10	20
Mentha arvensis (wild mint)	3	0-3	20
Penstemon procerus (slender blue beardtongue)	3	0-3	20
Potentilla anserina (silverweed)	10	0-10	20
Potentilla gracilis (graceful cinquefoil)	10	0-10	20
Pyrola asarifolia (common pink wintergreen)	10	0-10	20
Rumex occidentalis (western dock)	1	0-1	20
Smilacina stellata (star-flowered Solomon's-seal)	3	0-3	20
Solidago canadensis (Canada goldenrod)	1	0-1	20
Sonchus arvensis (perennial sow-thistle)	10	0-20	60
Stellaria longipes (long-stalked chickweed)	1	0-1	20
Thalictrum venulosum (veiny meadow rue)	10	0-10	20
Triglochin maritima (seaside arrow-grass)	3	0-3	20
Urtica dioica (common nettle)	1	0-1	20
Vicia americana (wild vetch)	1	0-1	20
Viola adunca (early blue violet)	1	0-1	20

SUCCESSIONAL INFORMATION

The *Salix petiolaris* (basket willow) community type is an early/mid-seral grazing disclimax of the *Salix petiolaris/Carex atherodes* (basket willow/awned sedge) habitat type or the *Salix petiolaris/Cornus stolonifera* (basket willow/red-osier dogwood) habitat type.

SOILS

Soils are commonly dark brown to black Chernozems, but can intergrade to soils of the Organic order under conditions favorable for organic matter accumulation. Soil textures vary from clay loam to sandy loam. Water tables are usually within 1 m (39 in) of the soil surface throughout summer. Redoximorphic features (mottles or gleyed soil) are common within 1 m (39 in) of the soil surface on sites of this type.

ADJACENT COMMUNITIES

Adjacent wetter sites may support the *Salix petiolaris/Carex atherodes* (basket willow/awned sedge) habitat type, the *Carex atherodes* (awned sedge) habitat type, any of several emergent herbaceous types, or be open water. Adjacent drier sites may support the *Populus tremuloides/Cornus stolonifera* (aspen/red-osier dogwood) community type or the *Bromus inermis* (awnless brome) community type, the *Agrostis stolonifera* (redtop) community type, or be developed agricultural land.

MANAGEMENT INFORMATION

Livestock

Stands of this type have begun to be opened, allowing for easy livestock access. Forage productivity is also higher, resulting in potentially even heavier utilization, especially as upland vegetation dries. *Poa pratensis* (Kentucky bluegrass) is a palatable and moderately productive grass, especially when soil moisture levels are high, and tolerates a high degree of defoliation.

Overuse by livestock will result in damaged or dead clumps and reduce the vigour of the willows present. With continued overuse, willows show a sharp decline in cover and may be eliminated from the site.

To minimize undesired changes in community composition and structure, pasture or allotment management should be based on the forage available from stands of this and other riparian or wetland communities. This concept of the riparian or wetland pasture has had some success in maintaining or improving the health of riparian or wetland vegetation (Kinch 1987).

Frisina (1991) states that for a grazing program to be successful, it must meet the basic biological requirements of the plants such as photosynthesis, food storage, reproduction, and seedling establishment. In order to meet these requirements, long periods of rest are needed. It is during long growing season rest periods that the essential biological processes of food production and storage, reproduction, and seedling establishment take place. In some instances, additional periods of rest may be required to either improve or maintain a plant community.

Wildlife

These dense willow communities, associated with *Carex* (sedge) meadows and topographical depressions, provide browse and good thermal and hiding cover for many wildlife species, usually in a beneficial mosaic pattern, within a landscape often already greatly altered by agricultural development.

Fisheries

The *Salix petiolaris* (basket willow) community type does not occur often in landscape positions that have much bearing on fisheries. When any willow species occupies a streambank position, it should be protected and promoted. The importance of willows in streambank stabilization, cover, and thermal protection for fisheries cannot be over emphasized.

Fire

At this date we know little about the response of *Salix petiolaris* (basket willow) to being burned, but suspect that, like most willow species, it readily sprouts from the rootstocks after fire that is not extremely hot. Rhizomatous grasses that characterize the disturbed understory of this type, such as *Poa pratensis* (Kentucky bluegrass) and *Bromus inermis* (awnless brome), are usually promoted by fire that does not burn extremely hot (USDA IFSL 1995).

Soil Management and Rehabilitation Opportunities

Salix petiolaris (basket willow) is readily propagated through cuttings (Plants for a Future 2000), therefore is adaptable to rehabilitating suitable degraded sites where woody plants have been removed, but the water table remains high.

OTHER STUDIES

The *Salix petiolaris* (basket willow) community type has not been described by others.

***Amelanchier alnifolia* Community Type**
(Saskatoon Community Type)

AMELALN

Number of Stands Sampled = 9

Number of Stands Sampled in Saskatchewan = 6

LOCATION AND ASSOCIATED LANDFORMS

The *Amelanchier alnifolia* (Saskatoon) community type is an incidental type at low to mid elevations in southern Saskatchewan. Stands are located on moist sites on alluvial benches. This community type occurs as small dense thickets, narrow bands, or irregular patches.

VEGETATION

Less disturbed stands dominated by *Amelanchier alnifolia* (Saskatoon) form dense shrub communities covered by closed canopies of that species (Table 37). When disturbance occurs, stands become more open and include a wider diversity of other species.

Table 37. Average canopy cover, range of canopy cover, and constancy for species recorded in 9 stands of the *Amelanchier alnifolia* (Saskatoon) community type

TABLE 37.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Trees			
Populus balsamifera (balsam poplar)	1	0-1	11
Populus tremuloides (aspen)	3	0-3	11
Shrubs			
Amelanchier alnifolia (Saskatoon)	68	30-98	100
Cornus stolonifera (red-osier dogwood)	15	0-20	22
Corylus cornuta (beaked hazelnut)	3	0-3	22
Crataegus rotundifolia (round-leaved hawthorn)	1	0-1	11
Elaeagnus commutata (silverberry)	1	0-1	11
Prunus pensylvanica (pin cherry)	10	0-10	11
Prunus virginiana (choke cherry)	15	3-30	100
Ribes americanum (wild black currant)	3	0-3	11
Ribes oxyacanthoides (northern gooseberry)	1	0-1	22
Rosa spp. (rose)	4	0-10	89
Rubus idaeus (wild red raspberry)	5	0-10	22
Salix bebbiana (beaked willow)	1	0-1	11
Symphoricarpos occidentalis (buckbrush)	7	1-10	100
Graminoids			
Agrostis stolonifera (redtop)	3	0-3	22
Agropyron trachycaulum (slender wheat grass)	2	0-3	22
Bromus inermis (awnless brome)	20	0-50	33
Calamagrostis inexpansa (northern reed grass)	3	0-3	11
Carex siccata (hay sedge)	10	0-10	11
Carex sprengelii (Sprengel's sedge)	24	0-40	33
Elymus virginicus (Virginia wild rye)	1	0-1	11
Koeleria macrantha (June grass)	1	0-1	11
Muhlenbergia racemosa (marsh muhly)	3	0-3	11
Poa palustris (fowl bluegrass)	1	0-1	11
Poa pratensis (Kentucky bluegrass)	15	0-20	22
Stipa viridula (green needle grass)	1	0-1	11
Forbs			
Achillea millefolium (common yarrow)	1	0-1	11
Actaea rubra (red and white baneberry)	1	0-1	11
Anemone cylindrica (long-fruited anemone)	2	0-3	22
Aralia nudicaulis (wild sarsaparilla)	50	0-90	22
Artemisia ludoviciana (prairie sagewort)	1	0-1	11
Aster ericoides (tufted white prairie aster)	3	0-3	11
Aster hesperius (western willow aster)	1	0-1	11
Cirsium arvense (Canada thistle)	1	0-1	22
Disporum trachycarpum (fairybells)	1	0-1	22

TABLE 37.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Epilobium angustifolium (common fireweed)	1	0-1	11
Fragaria virginiana (wild strawberry)	1	0-3	33
Galium boreale (northern bedstraw)	5	0-20	67
Galium triflorum (sweet-scented bedstraw)	2	0-3	33
Geranium richardsonii (wild white geranium)	1	0-1	11
Geum macrophyllum (large-leaved yellow avens)	1	0-1	11
Glycyrrhiza lepidota (wild licorice)	1	0-1	11
Lactuca serriola (prickly lettuce)	3	0-3	11
Lappula squarrosa (bluebur)	1	0-1	11
Maianthemum canadense (wild lily-of-the-valley)	3	0-3	11
Smilax herbacea (Carrionflower)	1	0-1	11
Smilacina stellata (star-flowered Solomon's-seal)	2	0-3	67
Solidago canadensis (Canada goldenrod)	1	0-1	33
Stachys palustris (marsh hedge-nettle)	1	0-1	11
Taraxacum officinale (common dandelion)	1	0-1	11
Thalictrum venulosum (veiny meadow rue)	10	0-10	11
Vicia americana (wild vetch)	1	0-3	33
Viola canadensis (western Canada violet)	19	0-50	33

SUCCESSIONAL INFORMATION

The *Amelanchier alnifolia* (Saskatoon) community type may represent an early primary successional stage that colonizes stream bars and adjacent floodplains. It seems to be successional to such types as the *Picea glauca/Cornus stolonifera* (white spruce/red-osier dogwood) habitat type, and perhaps also to the *Salix lutea/ Cornus stolonifera* (yellow willow/red-osier dogwood) habitat type or the *Salix bebbiana/ Cornus stolonifera* (beaked willow/red-osier dogwood) habitat type.

With severe grazing/browsing pressure, dense stands of *Amelanchier alnifolia* (Saskatoon) will be opened up so that disturbance-related species can invade. *Amelanchier alnifolia* (Saskatoon) is a highly preferred browse species for livestock and wild ungulates. Under heavy utilization, the *Amelanchier alnifolia* (Saskatoon) will decrease, and *Rosa* species (rose) and *Symphoricarpos occidentalis* (buckbrush) will increase. Herbaceous species such as *Poa pratensis* (Kentucky bluegrass) and *Bromus inermis* (awnless brome) will take opportunistic advantage of the increased sunlight in the opened stand.

Although this species is highly preferred for browse by wildlife and livestock, it seems able to repopulate sites where it was once severely reduced. For this reason we believe that large cover of *Amelanchier alnifolia* (Saskatoon) can not tell us that the community on a site is unaltered, but only that it has been free from severe browsing for several years.

SOILS

Soils are commonly young Brunisols or Regosols with little or no development. Texture varies little from clay loam to sandy loam with abundant coarse fragments throughout the soil profile. Water tables are usually within 1 m (39 in) of the soil surface throughout summer. Redoximorphic features (mottles or gleyed soil) are common within 1 m (39 in) of the soil surface. Estimated available water ranges from low to moderate. This type of substrate is important to many floodplain communities.

ADJACENT COMMUNITIES

Adjacent wetter communities may include younger *Populus* species (cottonwood, poplar, or aspen) stands, *Salix exigua* (sandbar willow), *Carex atherodes* (awned sedge), or open water. Adjacent drier communities may include *Prunus virginiana* (choke cherry), *Rosa* species (rose), *Symphoricarpos occidentalis* (buckbrush), or a variety of upland communities.

MANAGEMENT INFORMATION

Livestock

Forage production is moderate to high. Dense stands may inhibit access by livestock. *Amelanchier alnifolia* (Saskatoon) is highly preferred by livestock and wildlife, and its abundance can be a direct indication of past use levels. In some areas, livestock browsing of *Amelanchier alnifolia* (Saskatoon) may be quite high.

Wildlife

Amelanchier alnifolia (Saskatoon) is eaten by moose (Costain 1989) and by deer. Beaver may use it for food and building materials (Allen 1983). The dense stands provide hiding and thermal cover for many small mammals and birds.

Fisheries

Amelanchier alnifolia (Saskatoon) is an excellent shrub for controlling erosion along streams. This is particularly important on higher gradient streams where scoured by seasonal flooding. The dense, overhanging shrubs along the streambanks also provide protection and hiding cover for fish from predators.

Fire

Above ground foliage of *Amelanchier alnifolia* (Saskatoon) is usually killed by fire. However, the roots will survive all but the most severe fires, which remove the duff and heat the upper soil for extended periods. After a fire, the shrubs sprout from surviving rhizomes or stolons (runners) (Fischer and Bradley 1987). Red-osier dogwood generally increases following fire, and it may invade a recently burned area from adjacent unburned areas, but it may take some time before resprouting red-osier dogwood regains its former cover and volume. In moist forests of British Columbia, red-osier dogwood appears to increase in abundance following logging and burning (USDA IFSL 1995).

Soil Management and Rehabilitation Opportunities

Coarse textured soils and high coarse fragment content minimizes most soil compaction problems. The *Amelanchier alnifolia* (Saskatoon) community type is often subject to scouring by floods and to alluvial deposition. Stands are relatively stable due to strong roots and stems. Management should emphasize the importance of *Cornus stolonifera* (red-osier dogwood) for streambank stabilization.

For revegetation of degraded sites, *Amelanchier alnifolia* (Saskatoon) is valuable as it is readily established along stream edges by direct seeding, by transplanting rooted cuttings, or nursery grown seedlings. Its rapid growth quickly stabilizes deteriorated streambanks.

Recreational Uses and Considerations

Due to the frequency of flooding, campsites and buildings should be located elsewhere. However, this community type offers good opportunities for viewing wildlife.

OTHER STUDIES

Michalsky and others (1994) describe a Saskatoon-Chokecherry-Canada Gooseberry vegetation type on the Grasslands National Park in extreme southern Saskatchewan.

Artemisia cana/Agropyron smithii Habitat Type (Silver Sagebrush/Western Wheat Grass Habitat Type)

ARTECAN/AGROSMI
Number of Stands Sampled = 43
Number of Stands Sampled in Saskatchewan = 1

CAUTION—Not all sites currently dominated by *Artemisia cana* (silver sagebrush) are considered riparian or wetland sites. In some instances, they are considered upland sites. The topographic position of the site must match the description as presented in the Location and Associated Landform section.

LOCATION AND ASSOCIATED LANDFORMS

The *Artemisia cana/Agropyron smithii* (silver sagebrush/western wheat grass) habitat type occupies nearly level, older alluvial terraces on both broad and narrow floodplains and coalescing alluvial fans in valleys. It is a minor type in the Mixed Grassland Ecoregion of southwestern Saskatchewan. The *Artemisia cana/Agropyron smithii* (silver sagebrush/western wheat grass) habitat type represents one of the driest types found in the riparian or wetland zone. Sites are located in deep, loamy, alluvial soils, or where overland flow or soil conditions (fine textured soils), or a combination of both, allow a greater than normal moisture regime. In some situations, fine textured soils have resulted in a perched water table. The *Artemisia cana/Agropyron smithii* (silver sagebrush/western wheat grass) habitat type has been found to function as a disturbance-caused (disclimax) habitat type where site potential has been altered by prolonged heavy grazing.

VEGETATION

Artemisia cana (silver sagebrush) dominates the shrub layer and *Agropyron smithii* (western wheat grass) dominates the herbaceous layer. *Stipa viridula* (green needle grass) is important in undisturbed sites (Table 38).

Table 38. Average canopy cover, range of canopy cover, and constancy for species recorded in 9 late seral to climax stands of the *Artemisia cana/Agropyron smithii* (silver sagebrush/western wheat grass) habitat type

TABLE 38.	**% Can. Cov.**		
Species	**Avg.**	**Rng.**	**Con.**
Shrubs			
Artemisia cana (silver sagebrush)	39	3-80	100
Atriplex nuttallii (Nuttall's atriplex)	1	0-1	11
Juniperus horizontalis (creeping juniper)	1	0-1	11
Ribes oxyacanthoides (northern gooseberry)	1	0-1	11
Rosa spp. (rose)	3	0-3	11
Symphoricarpos occidentalis (buckbrush)	2	0-3	22
Graminoids			
Agropyron pectiniforme (crested wheat grass)	1	0-1	11
Agropyron repens (quack grass)	1	0-1	11
Agropyron smithii (western wheat grass)	68	30-98	100
Agropyron trachycaulum (slender wheat grass)	2	0-3	33
Bouteloua gracilis (blue grama)	2	0-3	22
Bromus japonicus (Japanese chess)	10	0-10	11
Calamagrostis montanensis (plains reed grass)	10	0-10	11
Calamagrostis stricta (narrow reed grass)	1	0-1	22
Distichlis stricta (salt grass)	1	0-1	11
Koeleria macrantha (June grass)	5	0-10	33
Poa juncifolia (alkali bluegrass)	1	0-1	11
Stipa comata (needle-and-thread)	10	0-20	22
Stipa viridula (green needle grass)	7	0-30	67
Forbs			
Achillea millefolium (common yarrow)	2	0-3	56
Artemisia frigida (pasture sagewort)	1	0-3	33
Aster ericoides (tufted white prairie aster)	10	0-10	11
Chenopodium album (lamb's-quarters)	1	0-1	11
Conyza canadensis (Horseweed)	1	0-1	11

TABLE 38.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Erigeron annuus (whitetop)	1	0-1	11
Eurotia lanata (winter-fat)	1	0-1	11
Grindelia squarrosa (gumweed)	1	0-1	22
Gutierrezia sarothrae (broomweed)	1	0-1	11
Lactuca pulchella (common blue lettuce)	1	0-1	11
Melilotus officinalis (yellow sweet-clover)	1	0-3	33
Opuntia polyacantha (prickly-pear)	1	0-1	11
Parietaria pensylvanica (American pellitory)	1	0-1	11
Ratibida columnifera (prairie coneflower)	1	0-1	11
Sisymbrium altissimum (tumbling mustard)	1	0-1	11
Solidago canadensis (Canada goldenrod)	1	0-1	11
Sphaeralcea coccinea (scarlet mallow)	1	0-1	11
Taraxacum officinale (common dandelion)	1	0-1	11
Tragopogon dubius (common goat's-beard)	1	0-1	22
Vicia americana (wild vetch)	2	0-3	22

SUCCESSIONAL INFORMATION

Following disturbance, *Poa pratensis* (Kentucky bluegrass), *Bromus inermis* (awnless brome), *Bouteloua gracilis* (blue grama), *Achillea millefolium* (common yarrow), and *Taraxacum officinale* (common dandelion) increase dramatically. Cover of *Agropyron smithii* (western wheat grass) and *Stipa viridula* (green needle grass) decreases noticeably. Palatable species remaining in severely overgrazed stands are restricted to areas protected beneath the *Artemisia cana* (silver sagebrush) (Table 39).

Table 39. Average canopy cover, range of canopy cover, and constancy for species recorded in 34 disturbed and/or early to mid-seral stands of the *Artemisia cana/Agropyron smithii* (silver sagebrush/western wheat grass) habitat type

TABLE 39.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Shrubs			
Artemisia cana (silver sagebrush)	33	1-60	100
Artemisia tridentata (big sagebrush)	1	0-1	3
Atriplex nuttallii (Nuttall's atriplex)	3	0-3	3
Chrysothamnus nauseosus (rabbitbrush)	20	0-20	3
Chrysothamnus viscidiflorus (green rabbitbrush)	3	0-3	3
Rhus trilobata (skunkbush)	1	0-1	6
Rosa woodsii (common wild rose)	1	0-3	21
Rosa spp. (rose)	2	0-3	12
Salix amygdaloides (peach-leaved willow)	1	0-1	3
Sarcobatus vermiculatus (greasewood)	20	0-20	6
Symphoricarpos occidentalis (buckbrush)	17	0-60	50
Graminoids			
Agropyron dasystachyum (northern wheat grass)	1	0-1	3
Agropyron pectiniforme (crested wheat grass)	18	0-60	12
Agropyron repens (quack grass)	40	0-40	3
Agropyron smithii (western wheat grass)	48	0-80	94
Agropyron trachycaulum (slender wheat grass)	25	0-40	12
Bouteloua gracilis (blue grama)	7	0-20	21
Bromus inermis (awnless brome)	4	0-10	9
Bromus japonicus (Japanese chess)	21	0-60	26
Calamovilfa longifolia (sand grass)	17	0-40	15
Carex brevior (slender-beaked sedge)	3	0-3	3
Distichlis stricta (salt grass)	28	0-60	9
Elymus canadensis (Canada wild rye)	10	0-20	6
Elymus spp. (wild rye)	1	0-1	3
Festuca idahoensis (bluebunch fescue)	10	0-10	3
Hordeum jubatum (foxtail barley)	1	0-1	3
Koeleria macrantha (June grass)	15	0-40	15

TABLE 39.	**% Can. Cov.**		
Species	**Avg.**	**Rng.**	**Con.**
Muhlenbergia racemosa (marsh muhly)	7	0-20	9
Poa arida (plains bluegrass)	12	0-20	6
Poa bulbosa (Bulbous Bluegrass)	40	0-40	3
Poa fendleriana (Muttongrass)	3	0-3	3
Poa interior (inland bluegrass)	12	0-20	6
Poa palustris (fowl bluegrass)	1	0-1	3
Poa pratensis (Kentucky bluegrass)	25	0-60	38
Poa sandbergii (Sandberg bluegrass)	20	0-20	3
Poa spp. (bluegrass)	7	0-20	9
Puccinellia nuttalliana (Nuttall's salt-meadow grass)	3	0-3	3
Setaria viridis (green foxtail)	1	0-1	3
Spartina gracilis (alkali cord grass)	1	0-1	6
Sporobolus cryptandrus (sand dropseed)	15	0-40	9
Stipa comata (needle-and-thread)	7	0-20	15
Stipa viridula (green needle grass)	12	0-40	53
Forbs			
Achillea millefolium (common yarrow)	5	0-20	47
Agoseris glauca (yellow false dandelion)	1	0-1	3
Allium textile (prairie onion)	3	0-3	3
Antennaria parvifolia (small-leaved everlasting)	1	0-1	3
Arnica latifolia (broad-leaved arnica)	1	0-1	3
Artemisia dracunculus (dragonwort)	1	0-1	6
Artemisia frigida (pasture sagewort)	3	0-20	50
Artemisia ludoviciana (prairie sagewort)	9	0-20	24
Asclepias speciosa (showy milkweed)	1	0-1	3
Aster ericoides (tufted white prairie aster)	1	0-1	6
Aster spp. (aster)	1	0-1	6
Astragalus bisulcatus (two-grooved milk vetch)	1	0-1	3
Astragalus drummondii (Drummond's milk vetch)	1	0-1	3
Atriplex confertifolia (shadscale)	3	0-3	3
Bassia hyssopifolia (five-hook bassia)	3	0-3	3
Chenopodium album (lamb's-quarters)	1	0-1	6
Chenopodium leptophyllum (narrow-leaved goosefoot)	1	0-3	9
Chenopodium spp. (goosefoot)	2	0-3	6
Cirsium vulgare (bull thistle)	3	0-3	6
Convolvulus sepium (wild morning-glory)	3	0-3	3
Conyza canadensis (Horseweed)	3	0-3	3
Coryphantha vivipara (cushion cactus)	1	0-1	3
Crepis tectorum (annual hawk's-beard)	1	0-1	3
Cynoglossum officinale (hound's-tongue)	1	0-1	3
Unknown Forb	3	0-3	3
Galium aparine (cleavers)	1	0-1	3
Gaura coccinea (scarlet butterflyweed)	1	0-3	21
Glycyrrhiza lepidota (wild licorice)	2	0-3	6
Grindelia squarrosa (gumweed)	2	0-3	6
Gutierrezia sarothrae (broomweed)	1	0-1	3
Hackelia floribunda (large-flowered stickseed)	1	0-1	3
Hedeoma hispidum (pennyroyal)	1	0-1	3
Heterotheca villosa (golden aster)	1	0-1	6
Kochia scoparia (summer-cypress)	1	0-1	6
Lactuca pulchella (common blue lettuce)	3	0-3	6
Lappula occidentalis (western bluebur)	1	0-1	3
Lappula squarrosa (bluebur)	1	0-1	3
Lepidium densiflorum (common pepper-grass)	1	0-1	3
Lepidium spp. (pepper-cress)	1	0-1	3
Lepidium perfoliatum (perfoliate pepper-grass)	10	0-10	3
Linum lewisii (wild blue flax)	1	0-1	6
Medicago sativa (alfalfa)	1	0-1	3
Melilotus alba (white sweet-clover)	1	0-1	6
Melilotus officinalis (yellow sweet-clover)	1	0-3	9
Mentzelia decapetala (sand-lily)	1	0-1	3
Monolepis nuttalliana (spear-leaved goosefoot)	2	0-3	9
Oenothera biennis (yellow evening-primrose)	1	0-1	3
Opuntia fragilis (brittle prickly-pear)	1	0-1	6
Opuntia polyacantha (prickly-pear)	4	0-20	21
Parietaria pensylvanica (American pellitory)	3	0-3	6
Phlox hoodii (moss phlox)	3	0-3	3

TABLE 39.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Plantago elongata (linear-leaved plantain)	3	0-3	3
Plantago patagonica (Pursh's plantain)	2	0-3	6
Psoralea argophylla (silverleaf psoralea)	1	0-1	3
Ratibida columnifera (prairie coneflower)	1	0-1	3
Salsola kali (Russian-thistle)	20	0-20	3
Sisymbrium altissimum (tumbling mustard)	1	0-1	3
Sisymbrium loeselii (tall hedge mustard)	1	0-1	3
Smilacina stellata (star-flowered Solomon's-seal)	1	0-1	6
Solidago canadensis (Canada goldenrod)	1	0-1	3
Solidago missouriensis (low goldenrod)	3	0-3	3
Solidago mollis (velvety goldenrod)	3	0-3	3
Sphaeralcea coccinea (scarlet mallow)	2	0-3	6
Taraxacum officinale (common dandelion)	3	0-10	18
Thalictrum dasycarpum (tall meadow rue)	1	0-1	3
Thermopsis rhombifolia (golden bean)	10	0-10	3
Thlaspi arvense (stinkweed)	5	0-10	12
Tragopogon dubius (common goat's-beard)	2	0-3	9
Trifolium spp. (clover)	1	0-1	3
Vicia americana (wild vetch)	3	0-10	29
Xanthium strumarium (cocklebur)	1	0-1	3
Ferns and Allies			
Equisetum laevigatum (smooth scouring-rush)	3	0-3	3

Some sites may currently be dominated by widely spaced, decadent, or dying cottonwoods with an understory of *Artemisia cana* (silver sagebrush) and *Agropyron smithii* (western wheat grass). *Symphoricarpos occidentalis* (buckbrush) may be present. This situation represents a mid/late seral primary successional stage of the *Artemisia cana/Agropyron smithii* (silver sagebrush/western wheat grass) habitat type. The old alluvial terrace supporting the early seral cottonwood community has become drier due to channel downcutting or migration away from the site. Floods no longer reach the site with sufficient frequency or duration to enable repopulation with new cottonwoods.

The *Artemisia cana/Agropyron smithii* (silver sagebrush/western wheat grass) habitat type is very likely the potential for the site, but in some cases may be a grazing induced disclimax on a site that would otherwise have had natural potential for another climax community, such as one dominated by *Salix lutea* (yellow willow).

SOILS

Soils are Chernozems of texture varying little from clay loam to loam. *Artemisia cana* (silver sagebrush) is very tolerant of imperfect drainage, high water tables, and periodic flooding. Overland flows of spring runoff and storms help to recharge the water table. Redox concentrations (mottles) are common, indicating a fluctuating water table. Available water is estimated at moderate. Soil reaction ranges between slightly acid to moderately alkaline (pH 6.0 to 8.0). Some sites sampled occurred on weakly saline soils.

ADJACENT COMMUNITIES

Adjacent wetter sites may be the *Fraxinus pennsylvanica/Prunus virginiana* (green ash/choke cherry) or the *Acer negundo/Prunus virginiana* (Manitoba maple/choke cherry) habitat types. In other situations, wetter sites may be dominated by cottonwoods or willows. Adjacent drier sites are dominated by a variety of upland shrub and/or grassland communities.

MANAGEMENT INFORMATION

Livestock

Forage production is moderate to high. Palatability of *Artemisia cana* (silver sagebrush) is rated low for cattle and fair for sheep. However, *Agropyron smithii* (western wheat grass) is highly desired by livestock. *Agropyron smithii* (western wheat grass) is palatable and nutritious when green in the spring, and moderately so during other times of the year (Johnson and Nichols 1982). Vigorous rhizomes make *Agropyron smithii* (western wheat grass) one of the more tolerant of the desirable and abundant grasses to drought and grazing pressure. However, overgrazing in May and June will decrease it. When growing conditions improve, such as following drought or overgrazing, this species may rapidly recolonize areas previously occupied.

Winter use of *Artemisia cana* (silver sagebrush) by all types of grazing animals may be especially heavy when snow covers lower growing vegetation. Many sites of this type are used as winter feeding ground for livestock due to low elevation and the availability of water (e.g. springs, streams, etc.).

Herbicides have been effective in eliminating *Artemisia cana* (silver sagebrush) and releasing the various grass species if applied when *Artemisia cana* (silver sagebrush) is phenologically active. If grazing has eliminated the more desirable grasses, less desirable forbs may increase.

Wildlife

Palatability of *Artemisia cana* (silver sagebrush) is rated good for deer, elk, and antelope, especially in winter when snow covers lower growing vegetation. However, *Agropyron smithii* (western wheat grass) is highly desired by wildlife such as deer and antelope. *Agropyron smithii* (western wheat grass) is highly palatable and nutritious when green in the spring, and moderately so during other times of the year (Johnson and Nichols 1982).

The moderate degree of structural diversity of the *Artemisia cana/Agropyron smithii* (silver sagebrush/western wheat grass) habitat type provides thermal and hiding cover for big game and is important winter habitat for antelope. Therefore, heavy grazing pressure by livestock in this habitat type may have serious consequences for those wildlife species.

The *Artemisia cana/Agropyron smithii* (silver sagebrush/western wheat grass) habitat type provides food and nesting cover for the sage grouse. The type has been identified as critically important habitat to the survival of this upland game bird, a species at risk in Saskatchewan and Alberta (Bristol 2000). Many migratory songbirds also utilize this type, including the sage thrasher, another species at risk. This type also provides important foraging ground for burrowing owls and other open area raptors (Bristol 2000).

Fire

Artemisia cana (silver sagebrush) usually sprouts vigorously from root suckers following spring burns, with associated temporary increases in cover of palatable grasses (White and Currie 1982). Fall burns typically have higher shrub mortality and reduced vigour of *Artemisia cana* (silver sagebrush) sprouts.

Agropyron smithii (western wheat grass) has a good tolerance for fire when in dormant state. It usually survives a fire during the growing season, but recovery may be delayed (Wasser 1982).

Soil Management and Rehabilitation Opportunities

Artemisia cana (silver sagebrush) may be useful in revegetating some degraded wetland sites. It is well adapted to newly exposed soils and tolerates short periods of flooding. *Artemisia cana* (silver sagebrush) is used in seed mixtures for big game range restoration, highway right-of-way stabilization and beautification, and in mine reclamation work (Wasser 1982). Establishment is through direct seeding or the use of seedlings. Seedling success rates are typically high and growth rates are rapid. It is important to reduce competition by preparing a seedbed and to reduce animal stocking and weed competition during seedling establishment. Established plants provide a fair degree of soil stability.

Agropyron smithii (western wheat grass) is potentially valuable for revegetating disturbed or degraded wetland sites of appropriate type. Use of transplants will speed recovery, as seedlings are typically slow growing. However, once established, plants will quickly spread by rhizomes.

Recreational Uses and Considerations

Recreational potential is excellent for both big game and upland bird hunting. Sites may offer excellent opportunities for campsites or nature trails, if soils do not have much clay.

OTHER STUDIES

The *Artemisia cana/Agropyron smithii* (silver sagebrush/western wheat grass) habitat type is also described by Hansen and others (1995) for the Great Plains portion of Montana. That work is an expanded description of the *Artemisia cana/Agropyron smithii* habitat (silver sagebrush/western wheat grass) type defined by Hansen and others (1984) and by Hansen and Hoffman (1988) in the region surrounding the common corners of western North and South Dakota, and eastern Montana and Wyoming. Similar types have been described for the northern Great Plains by Hanson and Whitman (1938), Mackie (1970), and Jorgensen (1979). An *Artemisia cana* (silver sagebrush) community is described by Lawrence and Romo (1994) on the Matador Research Station in southern Saskatchewan. Michalsky and others (1994) describe a Sagebrush-Western Wheatgrass- Prickly Pear Cactus vegetation type on the Grasslands National Park in extreme southern Saskatchewan.

Betula occidentalis Community Type
(Water Birch Community Type)

BETUOCC

Number Of Stands Sampled = 22

Number Of Stands Sampled in Saskatchewan = 5

LOCATION AND ASSOCIATED LANDFORMS

The *Betula occidentalis* (water birch) community type is an incidental type at low elevations in southern Saskatchewan. Stands occupy alluvial terraces, streambanks, floodplains, moist areas around springs and seeps located along valley toe slopes, and in pockets around seeps hanging on steep valley walls.

VEGETATION

Betula occidentalis (water birch) dominates the overstory of this community type. Other shrubs present may include *Cornus stolonifera* (red-osier dogwood), *Symphoricarpos occidentalis* (buckbrush), and *Rosa* species (rose). A diverse mixture of disturbance-related herbaceous species tends to dominate the lowest layer of the community type. *Smilacina stellata* (star-flowered Solomon's-seal) is almost always present in this community (Table 40).

Table 40. Average canopy cover, range of canopy cover, and constancy for species recorded in the 4 stands sampled of the *Betula occidentalis* (water birch) community type that are relatively undisturbed by livestock or wildlife

TABLE 40.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Trees			
Populus x acuminata (lance-leaf cottonwood)	3	0-3	25
Populus tremuloides (aspen)	1	0-1	25

TABLE 40.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Shrubs			
Amelanchier alnifolia (Saskatoon)	8	0-20	75
Betula occidentalis (water birch)	53	40-70	100
Clematis ligusticifolia (western clematis)	1	0-3	75
Cornus stolonifera (red-osier dogwood)	21	3-30	100
Elaeagnus commutata (silverberry)	1	0-1	25
Juniperus communis (ground juniper)	1	0-1	25
Juniperus horizontalis (creeping juniper)	40	0-40	25
Lonicera tatarica (tatarian honeysuckle)	3	0-3	25
Prunus virginiana (choke cherry)	5	3-10	100
Ribes oxyacanthoides (northern gooseberry)	3	0-3	25
Rosa spp. (rose)	2	1-3	100
Rubus idaeus (wild red raspberry)	3	0-3	25
Salix bebbiana (beaked willow)	3	0-3	25
Salix lutea (yellow willow)	3	0-3	25
Shepherdia canadensis (thorny buffaloberry)	10	0-10	25
Symphoricarpos occidentalis (buckbrush)	11	0-20	75
Graminoids			
Agrostis stolonifera (redtop)	3	0-3	25
Bromus inermis (awnless brome)	20	0-20	25
Unknown Grass	3	0-3	25
Poa palustris (fowl bluegrass)	1	0-1	25
Poa pratensis (Kentucky bluegrass)	10	0-10	25
Forbs			
Achillea millefolium (common yarrow)	1	0-1	25
Actaea rubra (red and white baneberry)	1	0-1	25
Anemone spp. (anemone)	1	0-1	25
Aster laevis (smooth aster)	2	0-3	50
Cirsium arvense (Canada thistle)	3	0-3	25
Disporum trachycarpum (fairybells)	1	0-1	25
Fragaria virginiana (wild strawberry)	1	0-1	75
Galium boreale (northern bedstraw)	2	0-3	50
Galium triflorum (sweet-scented bedstraw)	3	0-3	25
Geranium richardsonii (wild white geranium)	3	0-3	25
Geum macrophyllum (large-leaved yellow avens)	1	0-1	25
Glycyrrhiza lepidota (wild licorice)	3	0-3	25
Lathyrus ochroleucus (cream-colored vetchling)	1	0-1	25
Pyrola asarifolia (common pink wintergreen)	3	0-3	25
Pyrola elliptica (white wintergreen)	1	0-1	25
Smilacina stellata (star-flowered Solomon's-seal)	6	1-20	100
Solidago canadensis (Canada goldenrod)	2	0-3	50
Sonchus spp. (sow-thistle)	1	0-1	25
Taraxacum officinale (common dandelion)	1	0-1	25
Vicia americana (wild vetch)	2	0-3	50
Ferns and Allies			
Equisetum arvense (common horsetail)	3	0-3	25

SUCCESSIONAL INFORMATION

We cannot be certain of the seral status of stands dominated by *Betula occidentalis* (water birch) because none were found that could be determined to be free of human caused disturbance. Some sites presently dominated by *Betula occidentalis* (water birch) may be seral to the *Salix lutea/Cornus stolonifera* (yellow willow/red-osier dogwood) habitat type. Heavy grazing pressures will prevent successful *Betula occidentalis* (water birch) regeneration, cause reduction or elimination of other desirable shrubs, and cause an increase of disturbance-related herbaceous species (Table 41). This results in reduction of the site to the disturbed stage of the *Betula occidentalis* (water birch) community type.

Table 41. Average canopy cover, range of canopy cover, and constancy for species recorded in 18 stands sampled of the *Betula occidentalis* (water birch) community type that are disturbed by livestock or wildlife

TABLE 41.	**% Can. Cov.**		
Species	**Avg.**	**Rng.**	**Con.**
Shrubs			
Alnus tenuifolia (river alder)	1	0-1	6
Amelanchier alnifolia (Saskatoon)	5	0-10	33
Arctostaphylos uva-ursi (common bearberry)	3	0-3	6
Betula occidentalis (water birch)	64	30-98	100
Clematis ligusticifolia (western clematis)	2	0-3	22
Cornus stolonifera (red-osier dogwood)	9	0-40	72
Elaeagnus commutata (silverberry)	6	0-20	39
Juniperus communis (ground juniper)	1	0-1	11
Juniperus horizontalis (creeping juniper)	37	0-70	11
Potentilla fruticosa (shrubby cinquefoil)	3	0-3	11
Prunus virginiana (choke cherry)	13	0-40	28
Rhus radicans (poison ivy)	15	0-40	22
Rhus trilobata (skunkbush)	3	0-3	6
Ribes oxyacanthoides (northern gooseberry)	2	0-3	33
Ribes spp. (currant)	3	0-3	11
Rosa woodsii (common wild rose)	13	0-20	28
Rosa spp. (rose)	6	0-20	56
Rubus idaeus (wild red raspberry)	3	0-3	6
Salix bebbiana (beaked willow)	3	0-10	39
Salix exigua (sandbar willow)	2	0-3	11
Salix lutea (yellow willow)	3	0-3	17
Salix petiolaris (basket willow)	10	0-10	6
Salix pseudomonticola (false mountain willow)	3	0-3	6
Shepherdia argentea (thorny buffaloberry)	7	0-20	28
Shepherdia canadensis (Canada buffaloberry)	2	0-3	11
Symphoricarpos albus (snowberry)	30	0-40	11
Symphoricarpos occidentalis (buckbrush)	18	0-60	67
Graminoids			
Agropyron dasystachyum (northern wheat grass)	3	0-3	6
Agropyron smithii (western wheat grass)	10	0-10	6
Agrostis spp. (Agrostis)	3	0-3	6
Agrostis stolonifera (redtop)	25	0-60	28
Agropyron trachycaulum (slender wheat grass)	7	0-10	22
Bromus inermis (awnless brome)	12	0-40	22
Calamagrostis canadensis (bluejoint)	1	0-1	6
Calamagrostis stricta (narrow reed grass)	4	0-10	17
Carex aquatilis (water sedge)	3	0-3	6
Carex lanuginosa (woolly sedge)	3	0-3	6
Carex nebraskensis (Nebraska sedge)	10	0-10	6
Carex rostrata (beaked sedge)	3	0-3	6
Carex scirpoidea (rush-like sedge)	1	0-1	6
Carex sprengelii (Sprengel's sedge)	12	0-20	11
Carex spp. (sedge)	1	0-1	11
Elymus canadensis (Canada wild rye)	1	0-1	17
Elymus virginicus (Virginia wild rye)	10	0-10	6
Festuca idahoensis (bluebunch fescue)	3	0-3	6
Festuca spp. (fescue)	3	0-3	6
Juncus balticus (wire rush)	10	0-10	6
Muhlenbergia glomerata (bog muhly)	3	0-3	6
Muhlenbergia racemosa (marsh muhly)	1	0-1	6
Phleum pratense (timothy)	11	0-20	17
Poa palustris (fowl bluegrass)	4	0-10	17
Poa pratensis (Kentucky bluegrass)	29	0-80	50
Stipa spp. (needle grass)	3	0-3	6
Stipa viridula (green needle grass)	1	0-1	6
Forbs			
Achillea millefolium (common yarrow)	3	0-3	6
Actaea rubra (red and white baneberry)	1	0-1	6
Agastache spp. (giant-hyssop)	3	0-3	6
Allium schoenoprasum (wild chives)	1	0-1	6
Angelica arguta (white angelica)	1	0-1	6
Apocynum androsaemifolium (spreading dogbane)	12	0-20	11
Aralia nudicaulis (wild sarsaparilla)	20	0-20	6

TABLE 41.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Artemisia frigida (pasture sagewort)	2	0-3	11
Asclepias speciosa (showy milkweed)	1	0-1	6
Aster ericoides (tufted white prairie aster)	1	0-1	6
Aster hesperius (western willow aster)	3	0-3	6
Aster laevis (smooth aster)	1	0-1	11
Aster spp. (aster)	1	0-1	6
Campanula rotundifolia (harebell)	1	0-1	11
Carduus nutans (nodding thistle)	1	0-1	6
Celastrus scandens (American bittersweet)	1	0-1	11
Cicuta maculata (water-hemlock)	1	0-1	6
Cirsium arvense (Canada thistle)	7	0-20	33
Cynoglossum officinale (hound's-tongue)	1	0-1	6
Disporum trachycarpum (fairybells)	8	0-20	17
Epilobium ciliatum (northern willowherb)	3	0-3	6
Erigeron acris (northern daisy fleabane)	1	0-1	6
Euphorbia esula (leafy spurge)	3	0-3	6
Fragaria virginiana (wild strawberry)	6	0-20	28
Galium boreale (northern bedstraw)	7	0-20	28
Gentiana affinis (prairie gentian)	1	0-1	6
Geranium richardsonii (wild white geranium)	1	0-3	17
Glycyrrhiza lepidota (wild licorice)	10	0-20	22
Heracleum lanatum (cow parsnip)	3	0-3	11
Lysimachia ciliata (fringed loosestrife)	10	0-10	6
Medicago lupulina (black medick)	1	0-1	6
Melilotus alba (white sweet-clover)	3	0-3	6
Mentha arvensis (wild mint)	2	0-3	11
Moehringia lateriflora (blunt-leaved sandwort)	1	0-1	6
Monarda fistulosa (wild bergamot)	1	0-1	11
Osmorhiza depauperata (spreading sweet cicely)	1	0-1	6
Plantago major (common plantain)	1	0-1	6
Prunella vulgaris (heal-all)	1	0-1	6
Rudbeckia laciniata (tall coneflower)	20	0-20	6
Rumex crispus (curled dock)	1	0-1	6
Sanicula marilandica (snakeroot)	10	0-20	11
Senecio pauperculus (balsam groundsel)	1	0-1	6
Smilacina stellata (star-flowered Solomon's-seal)	7	0-20	83
Solidago canadensis (Canada goldenrod)	8	0-20	39
Solidago spp. (goldenrod)	1	0-1	6
Solidago gigantea (late goldenrod)	5	0-10	11
Sonchus arvensis (perennial sow-thistle)	1	0-1	6
Sonchus asper (prickly annual sow-thistle)	3	0-3	6
Sonchus spp. (sow-thistle)	5	0-10	11
Stachys palustris (marsh hedge-nettle)	1	0-1	6
Taraxacum officinale (common dandelion)	4	0-10	33
Thalictrum dasycarpum (tall meadow rue)	1	0-1	6
Thalictrum venulosum (veiny meadow rue)	2	0-3	11
Thermopsis rhombifolia (golden bean)	10	0-20	22
Tragopogon dubius (common goat's-beard)	1	0-1	6
Trifolium repens (white clover)	1	0-1	6
Urtica dioica (common nettle)	42	0-80	11
Vicia americana (wild vetch)	1	0-3	22
Viola adunca (early blue violet)	5	0-10	11
Viola canadensis (western Canada violet)	2	0-3	11
Zizia aptera (heart-leaved Alexanders)	1	0-1	6
Ferns and Allies			
Equisetum arvense (common horsetail)	1	0-3	28
Equisetum hyemale (common scouring-rush)	40	0-40	6
Equisetum laevigatum (smooth scouring-rush)	3	0-3	6

Disturbance Stages

Betula occidentalis (water birch) is highly adapted to most forms of disturbance. However, heavy grazing may eliminate the more palatable native graminoids, thereby replacing them with introduced species or non-palatable native species, as described above.

SOILS

Soils are most often thin Regosols overlying river cobbles or colluvium. Texture varies from loam to sand with abundant gravel throughout the profile. Water tables remain near the soil surface through out the summer. Coarse textured soils, moderate stream gradients, and high coarse fragment contents throughout the soil profile provide an environment for rapid movement of highly aerated groundwater. This type of substrate is important to many floodplain communities.

ADJACENT COMMUNITIES

Adjacent wetter communities may include the *Salix bebbiana/Carex atherodes* (beaked willow/awned sedge) habitat type or the *Carex atherodes* (awned sedge) habitat type. Drier sites may include a wide variety of types including all three of the *Populus* species/*Cornus stolonifera* (cottonwood, poplar, or aspen/red-osier dogwood) community types, or the shrubs: *Salix lutea* (yellow willow), *Shepherdia argentea* (thorny buffaloberry), *Symphoricarpos occidentalis* (buckbrush), and *Prunus virginiana* (choke cherry).

MANAGEMENT INFORMATION

Livestock

Forage productivity in the *Betula occidentalis* (water birch) community type varies inversely with density of the stand. Dense stands limit livestock use. Herbaceous species such as *Agrostis stolonifera* (redtop) and *Poa pratensis* (Kentucky bluegrass) provide spring forage. *Poa pratensis* (Kentucky bluegrass) is a palatable and moderately productive grass, especially when soil moisture levels are high, and it tolerates a high degree of defoliation. *Poa pratensis* (Kentucky bluegrass) is well adapted to grazing and is considered an increaser or an invader, especially if grazing intensities and durations are severe (Wasser 1982). This species can produce new shoots from existing tillers or rhizomes. Grazing practice influences the growth form of the species (Volland 1978). A high density of weak tillers of low vigour comes of season-long grazing. Stem densities are emphasized over aboveground biomass. Early season rest increases the vigour of individual plants. Fewer shoots may be produced, but total above ground biomass tends to increase.

Wildlife

Linear stands of *Betula occidentalis* (water birch) provide shade, hiding cover, and secure travel corridors for numerous wildlife species. The species is normally only lightly browsed, but if other woody species are scarce, utilization will occur. Its structural diversity also has high wildlife habitat value, especially for birds (Youngblood and others 1985a).

Fire

Shoots of the thin barked *Betula occidentalis* (water birch) are readily killed by fire, but plants resprout from uninjured basal buds. *Poa pratensis* (Kentucky bluegrass) is damaged only by a hot, intense fire. Cool burns will have little effect on *Poa pratensis* (Kentucky bluegrass) (Volland and Dell 1981), but spring burns may reduce tiller density (Dix and Smeins 1967). Intense burns during active growing periods can be used to control stands of *Poa pratensis* (Kentucky bluegrass) (Wasser 1982).

Soil Management and Rehabilitation Opportunities
Coarse textured soils and high coarse fragment contents minimize most soil compaction problems. Management should carefully consider maintaining this type because of its excellent streambank stabilization values.

Recreational Uses and Considerations
Recreational value is mostly associated with fisheries in adjacent streams. Access is difficult if stands are very dense. Heavy use may increase bank sloughing.

OTHER STUDIES

A *Betula occidentalis* (water birch) community type is described by Hansen and others (1995) for western Montana. Chadde and others (1988) described a *Betula occidentalis* (water birch) community type having a variety of undergrowth species. Padgett and others (1989) identified several *Betula occidentalis* (water birch) community types for Utah. They are *Betula occidentalis/Cornus stolonifera* (water birch/red-osier dogwood), *Betula occidentalis/Mesic* Forb (water birch/Mesic Forb), and *Betula occidentalis/Poa pratensis* (water birch/Kentucky bluegrass) community types.

Crataegus rotundifolia Community Type
(Round-leaved Hawthorn Community Type)

CRATROT
Number Of Stands Sampled = 14
Number Of Stands Sampled in Saskatchewan = 7

CAUTION—Not all sites currently dominated by *Crataegus rotundifolia* (round-leaved hawthorn) are considered riparian or wetland sites. In some instances, they are considered upland sites. The topographic position of the site must match the description as presented in the Location and Associated Landform section.

Note: The *Crataegus rotundifolia* (round-leaved hawthorn) community type includes all combinations of *Crataegus rotundifolia* (round-leaved hawthorn) and *Crataegus douglasii* (Douglas hawthorn) due to similarities in environmental conditions and management concerns.

LOCATION AND ASSOCIATED LANDFORMS

The *Crataegus rotundifolia* (round-leaved hawthorn) community type is a minor to incidental type at low to mid elevations in southern Saskatchewan. Stands occur along foothill drainages and valley bottoms. The type may occur on alluvial terraces along streams and rivers throughout the region, or on slopes immediately below a spring or seep.

VEGETATION

The *Crataegus rotundifolia* (round-leaved hawthorn) community type tends to develop small, narrow, or irregular dense thickets that are virtually impenetrable by man or beast. Communities dominated by *Crataegus rotundifolia* (round-leaved hawthorn) may have sparse understories of *Rosa* species (rose), *Prunus virginiana* (choke cherry), or *Symphoricarpos occidentalis* (buckbrush). Severe, prolonged disturbance can open up these stands, allowing *Rosa* species (rose), *Symphoricarpos occidentalis* (buckbrush), *Bromus inermis* (awnless brome), and *Poa pratensis* (Kentucky bluegrass) to increase (Table 42).

Table 42. Average canopy cover, range of canopy cover, and constancy for species recorded in 14 sampled stands of the grazing disclimax *Crataegus rotundifolia* (round-leaved hawthorn) community type

TABLE 42.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Trees			
Fraxinus pennsylvanica (green ash)	3	0-3	7
Picea glauca (white spruce)	1	0-1	7
Populus balsamifera (balsam poplar)	1	0-1	7
Populus tremuloides (aspen)	3	0-3	7
Shrubs			
Amelanchier alnifolia (Saskatoon)	2	0-3	36
Berberis repens (creeping mahonia)	3	0-3	7
Cornus stolonifera (red-osier dogwood)	1	0-3	29
Crataegus rotundifolia (round-leaved hawthorn)	78	30-98	100
Prunus americana (wild plum)	12	0-20	14
Prunus virginiana (choke cherry)	13	0-30	71
Ribes americanum (wild black currant)	7	0-10	14
Ribes inerme (mountain gooseberry)	1	0-1	7
Ribes lacustre (bristly black currant)	1	0-1	7
Ribes oxyacanthoides (northern gooseberry)	4	0-20	43
Rosa woodsii (common wild rose)	11	0-20	21
Rosa spp. (rose)	6	0-10	57
Rubus idaeus (wild red raspberry)	17	0-40	21
Salix bebbiana (beaked willow)	3	0-3	7
Spiraea alba (narrow-leaved meadowsweet)	10	0-10	7
Symphoricarpos occidentalis (buckbrush)	19	0-60	93
Graminoids			
Agropyron repens (quack grass)	1	0-1	7
Agrostis scabra (rough hair grass)	1	0-1	7
Agropyron smithii (western wheat grass)	11	0-30	29
Bromus carinatus (keeled brome)	1	0-1	7
Bromus inermis (awnless brome)	18	0-40	36
Bromus japonicus (Japanese chess)	25	0-40	14
Bromus tectorum (downy chess)	1	0-1	7
Carex athrostachya (long-bracted sedge)	3	0-3	7
Carex praegracilis (graceful sedge)	1	0-1	7
Carex sprengelii (Sprengel's sedge)	20	0-40	50
Carex vulpinoidea (fox sedge)	1	0-1	7
Cinna latifolia (drooping wood-reed)	3	0-3	7
Elymus virginicus (Virginia wild rye)	1	0-3	21
Hordeum jubatum (foxtail barley)	5	0-10	14
Phleum pratense (timothy)	10	0-10	14
Poa palustris (fowl bluegrass)	1	0-1	7
Poa pratensis (Kentucky bluegrass)	35	0-80	64
Stipa comata (needle-and-thread)	40	0-40	7
Stipa viridula (green needle grass)	1	0-1	7
Forbs			
Achillea millefolium (common yarrow)	10	0-20	21
Agastache foeniculum (giant hyssop)	1	0-1	7
Anemone cylindrica (long-fruited anemone)	2	0-3	14
Arctium minus (common burdock)	1	0-1	7
Arnica chamissonis (leafy arnica)	1	0-1	7
Artemisia biennis (biennial sagewort)	3	0-3	7
Chenopodium fremontii (Fremont's goosefoot)	3	0-3	7
Cirsium arvense (Canada thistle)	2	0-3	14
Daucus carota (wild carrot)	1	0-1	7
Disporum trachycarpum (fairybells)	1	0-1	7
Epilobium angustifolium (common fireweed)	1	0-1	7
Unknown Forb	3	0-3	7
Fragaria vesca (woodland strawberry)	10	0-10	7

TABLE 42.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Fragaria virginiana (wild strawberry)	3	0-3	14
Galium boreale (northern bedstraw)	6	0-20	36
Galium trifidum (small bedstraw)	1	0-1	7
Galium triflorum (sweet-scented bedstraw)	3	0-3	21
Geranium richardsonii (wild white geranium)	10	0-10	7
Geum aleppicum (yellow avens)	1	0-1	14
Geum macrophyllum (large-leaved yellow avens)	3	0-3	7
Geum spp. (avens)	1	0-1	7
Glycyrrhiza lepidota (wild licorice)	30	0-30	7
Habenaria spp. (bog orchid)	20	0-20	7
Heracleum lanatum (cow parsnip)	7	0-10	14
Humulus lupulus (common hop)	3	0-3	7
Lappula squarrosa (bluebur)	2	0-3	14
Lysimachia ciliata (fringed loosestrife)	5	0-10	14
Medicago lupulina (black medick)	1	0-1	7
Mentha arvensis (wild mint)	10	0-10	7
Monarda fistulosa (wild bergamot)	7	0-10	14
Osmorhiza depauperata (spreading sweet cicely)	1	0-1	7
Perideridia gairdneri (squawroot)	1	0-1	7
Plantago major (common plantain)	3	0-3	7
Polygonum amphibium (water smartweed)	10	0-10	7
Polygonum convolvulus (wild buckwheat)	3	0-3	7
Potentilla gracilis (graceful cinquefoil)	3	0-3	7
Potentilla norvegica (rough cinquefoil)	1	0-1	7
Ranunculus acris (tall buttercup)	1	0-1	7
Sanicula marilandica (snakeroot)	1	0-1	7
Senecio indecorus (rayless ragwort)	10	0-10	7
Senecio pauperculus (balsam groundsel)	1	0-1	7
Smilax herbacea (Carrionflower)	1	0-1	7
Smilacina stellata (star-flowered Solomon's-seal)	3	0-10	50
Sonchus arvensis (perennial sow-thistle)	3	0-3	7
Taraxacum officinale (common dandelion)	3	0-3	14
Thalictrum occidentale (western meadow rue)	3	0-3	7
Thalictrum venulosum (veiny meadow rue)	5	0-10	21
Trifolium repens (white clover)	1	0-1	7
Urtica dioica (common nettle)	8	0-30	43
Vicia americana (wild vetch)	3	0-3	14
Vicia spp. (vetch)	1	0-1	7
Viola arvensis (European field pansy)	1	0-1	7
Viola spp. (violet)	10	0-10	7
Viola canadensis (western Canada violet)	18	0-30	21
Ferns and Allies			
Equisetum pratense (meadow horsetail)	10	0-10	7

SUCCESSIONAL INFORMATION

We believe that the *Crataegus rotundifolia* (round-leaved hawthorn) community type is a mid-seral grazing disclimax. We have found no sites dominated by hawthorn that are not also heavily populated with other disturbance related species. A site currently supporting this community type within the Mixedgrass Ecoregion is likely to have been diverted by severe grazing disturbance from the *Acer negundo/Prunus virginiana* (Manitoba maple/choke cherry), or the *Fraxinus pennsylvanica/Prunus virginiana* (green ash/choke cherry) or *Populus tremuloides/ Cornus stolonifera* (aspen/red-osier dogwood) habitat type. Riparian sites of this community type in the Cypress Upland Ecoregion are likely to have been diverted from the *Picea glauca/Cornus stolonifera* (white spruce/red-osier dogwood) habitat type. Careful observation of site characteristics and any other remnant woody species can assist in the determination of site potential. *Crataegus rotundifolia* (round-leaved hawthorn) is a fairly long-lived species that can maintain a long tenure on a site.

Severe disturbance leads to large amounts of *Rosa woodsii* (common wild rose), *Symphoricarpos occidentalis* (buckbrush), *Bromus inermis* (awnless brome), and *Poa pratensis* (Kentucky bluegrass). Excessive disturbance may result in large areas of exposed soil surface.

SOILS

Soils are variable ranging from Regosols to Chernozems. Soil textures range from clay loam to sandy loam. Water tables are generally within 1 m (39 in) of the soil surface during spring runoff or after storm events but can fall below 1 m during dry periods. Flooding durations are usually brief, but the *Crataegus rotundifolia* (round-leaved hawthorn) community type is tolerant of poorly drained soils and prolonged flooding.

ADJACENT COMMUNITIES

Adjacent wetter communities may include *Fraxinus pennsylvanica/Prunus virginiana* (green ash/choke cherry), or *Acer negundo/Prunus virginiana* (Manitoba maple/choke cherry), habitat type or cottonwood, or willow types. Adjacent drier communities are typically dominated by upland communities.

MANAGEMENT INFORMATION

Livestock

Forage production from dense thickets is low. Stands may be so dense as to preclude most livestock use. However, cattle will eat *Crataegus* species (hawthorn) foliage within reach, as well as associated shrubs and herbaceous species. Heavy grazing and browsing pressure will cause an increase in *Rosa woodsii* (common wild rose), *Symphoricarpos occidentalis* (buckbrush), *Bromus inermis* (awnless brome), and *Poa pratensis s* (Kentucky bluegrass). Excessive disturbance may cause large areas of exposed soil. *Crataegus rotundifolia* (round-leaved hawthorn) stands provide dense shelter and shade where livestock prefer to loaf.

Wildlife

Stands of *Crataegus rotundifolia* (round-leaved hawthorn) community type have a high structural diversity, providing thermal and hiding cover for deer. Trails can be observed in most stands. This community type also supports a rich bird population even during winter. Berries of *Crataegus rotundifolia* (round-leaved hawthorn) dry on the twigs and supply food for birds and small mammals. The characteristic branching of *Crataegus rotundifolia* (round-leaved hawthorn) is especially good cover and nesting sites for birds such as magpies and thrushes. Upland game birds such as grouse and pheasants frequently use this community type.

Fire

Crataegus rotundifolia (round-leaved hawthorn) is fire tolerant. The species has shallow, much branched rhizomatous roots that will sprout and sucker after removal of above ground stems.

Soil Management and Rehabilitation Opportunities

The sprouting capability of *Crataegus rotundifolia* (round-leaved hawthorn), along with the strongly rhizomatous nature of many of the associated species makes the *Crataegus rotundifolia* (round-leaved hawthorn) community type an excellent soil stabilizer.

Recreational Uses and Considerations

Nature trails will be routed around dense stands of this type. However, *Crataegus rotundifolia* (round-leaved hawthorn) may be valuable for planting as a biological barrier to protect physical structures, fragile natural areas, and to direct foot traffic.

OTHER STUDIES

The *Crataegus rotundifolia* (round-leaved hawthorn) community type has not been described elsewhere. Hansen and others (1995) described a *Crataegus* *rotundifolia* (round-leaved hawthorn) community type for Montana. A *Crataegus* species (hawthorn) community is described by Lawrence and Romo (1994) on the Matador Research Station in southern Saskatchewan.

Elaeagnus commutata Community Type
(Silverberry Community Type)

ELAECOM
Number Of Stands Sampled = 20
Number Of Stands Sampled in Saskatchewan = 8

CAUTION—Not all sites currently dominated by *Elaeagnus commutata* (silverberry) are considered riparian or wetland sites. In some instances, they are considered upland sites. The topographic position of the site must match the description as presented in the Location and Associated Landform section.

LOCATION AND ASSOCIATED LANDFORMS

The *Elaeagnus commutata* (silverberry) community type is a major type at low to mid elevations in the Mixed and Moist Mixed Grassland Ecoregions of southern Saskatchewan, and a minor type in the Cypress Upland and Aspen Parkland Ecoregions. It occurs on alluvial floodplain terraces, in V-shaped ravines, swale-like depressions where overland flows provide additional moisture, and in some instances on slopes immediately below a seep or where blown snow accumulates.

Elaeagnus commutata (silverberry) occurs in a variety of habitats, including forests with *Picea glauca* (white spruce), *Populus tremuloides* (aspen), *Populus* species (cottonwood), and *Salix* species (willow), as well as in all of the prairie ecoregions. This species is an important shrub in the native mixed-grass prairie of southern Canada. It occurs in seral communities throughout the Intermountain region and is a riverine floodplain shrub in *Populus balsamifera* (balsam poplar) communities.

VEGETATION

The *Elaeagnus commutata* (silverberry) community type is dominated by a clonal colony of *Elaeagnus commutata* (silverberry) in a dense thicket that tends to enlarge itself by sending up new shoots at the stand periphery. For this reason stands of this type often show a slightly mounded shape, with taller plants near the centre and younger plants around the edge—much like *Populus tremuloides* (aspen), but only about 2-3 meters (3-10 feet) tall.

Although *Elaeagnus commutata* (silverberry) is a native species, this community type seems strongly related to site disturbance. The most constantly recorded species associated with *Elaeagnus commutata* (silverberry) are those we consider disturbance-related, such as *Rosa* species (rose), *Symphoricarpos occidentalis* (buckbrush), *Bromus inermis* (awnless brome), *Poa pratensis* (Kentucky bluegrass), and *Cirsium arvense* (Canada thistle) (Table 43).

Table 43. Average canopy cover, range of canopy cover, and constancy for species recorded in 20 sampled stands of the *Elaeagnus commutata* (silverberry) community type

TABLE 43.	**% Can. Cov.**		
Species	**Avg.**	**Rng.**	**Con.**
Trees			
Picea glauca (white spruce)	1	0-1	5
Populus balsamifera (balsam poplar)	1	0-1	5
Populus tremuloides (aspen)	1	0-1	10
Shrubs			
Amelanchier alnifolia (Saskatoon)	2	0-3	10
Artemisia cana (silver sagebrush)	20	0-20	5
Clematis ligusticifolia (western clematis)	3	0-3	5

TABLE 43.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Cornus stolonifera (red-osier dogwood)	1	0-1	5
Elaeagnus commutata (silverberry)	58	30-98	100
Juniperus horizontalis (creeping juniper)	80	0-80	5
Potentilla fruticosa (shrubby cinquefoil)	3	0-3	5
Prunus virginiana (choke cherry)	1	0-1	5
Rhus radicans (poison ivy)	3	0-3	5
Ribes oxyacanthoides (northern gooseberry)	2	0-3	10
Rosa spp. (rose)	13	0-40	70
Rubus idaeus (wild red raspberry)	2	0-3	10
Salix bebbiana (beaked willow)	3	0-3	5
Salix exigua (sandbar willow)	1	0-1	5
Spiraea alba (narrow-leaved meadowsweet)	1	0-1	5
Symphoricarpos occidentalis (buckbrush)	16	0-30	70
Graminoids			
Agropyron pectiniforme (crested wheat grass)	20	0-20	5
Agropyron repens (quack grass)	3	0-3	5
Agropyron smithii (western wheat grass)	26	0-50	20
Agrostis stolonifera (redtop)	5	0-10	10
Agropyron trachycaulum (slender wheat grass)	9	0-40	25
Bouteloua gracilis (blue grama)	5	0-10	10
Bromus inermis (awnless brome)	34	0-90	70
Calamovilfa longifolia (sand grass)	22	0-60	15
Carex raymondii (Raymond's sedge)	1	0-1	5
Carex sprengelii (Sprengel's sedge)	1	0-1	5
Distichlis stricta (salt grass)	3	0-3	5
Elymus virginicus (Virginia wild rye)	3	0-3	5
Festuca rubra (red fescue)	7	0-10	10
Hordeum jubatum (foxtail barley)	10	0-10	5
Juncus balticus (wire rush)	14	0-20	25
Koeleria macrantha (June grass)	7	0-10	15
Phleum pratense (timothy)	9	0-20	20
Poa compressa (Canada bluegrass)	2	0-3	10
Poa pratensis (Kentucky bluegrass)	30	0-70	70
Stipa spp. (needle grass)	1	0-1	5
Stipa columbiana (Columbia needle grass)	3	0-3	5
Stipa curtiseta (western porcupine grass)	3	0-3	5
Stipa richardsonii (Richardson needle grass)	1	0-1	5
Stipa viridula (green needle grass)	2	0-3	25
Forbs			
Achillea millefolium (common yarrow)	4	0-10	40
Allium cernuum (nodding onion)	1	0-1	5
Antennaria aprica (low everlasting)	3	0-3	5
Antennaria parvifolia (small-leaved everlasting)	3	0-3	5
Arctium minus (common burdock)	3	0-3	10
Artemisia absinthium (absinthe wormwood)	1	0-1	5
Artemisia dracunculus (dragonwort)	1	0-1	5
Artemisia frigida (pasture sagewort)	7	0-10	10
Artemisia ludoviciana (prairie sagewort)	3	0-3	15
Aster ciliolatus (Lindley's aster)	5	0-10	10
Aster ericoides (tufted white prairie aster)	3	0-3	35
Aster hesperius (western willow aster)	1	0-1	15
Aster laevis (smooth aster)	10	0-10	5
Aster spp. (aster)	1	0-1	5
Campanula rotundifolia (harebell)	1	0-3	15
Cirsium arvense (Canada thistle)	7	0-20	40
Cirsium flodmanii (Flodman's thistle)	3	0-3	5
Cirsium undulatum (wavy-leaved thistle)	4	0-10	15
Cynoglossum officinale (hound's-tongue)	10	0-10	5
Epilobium angustifolium (common fireweed)	10	0-10	5
Erigeron caespitosus (tufted fleabane)	1	0-1	5
Erigeron glabellus (smooth fleabane)	1	0-1	5
Euphorbia esula (leafy spurge)	70	0-70	5
Unknown Forb	1	0-1	5
Fragaria virginiana (wild strawberry)	3	0-10	25
Gaillardia aristata (gaillardia)	1	0-1	5
Galium boreale (northern bedstraw)	5	0-10	15
Geranium richardsonii (wild white geranium)	3	0-3	5

TABLE 43.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Geranium viscosissimum (sticky purple geranium)	1	0-1	5
Geum aleppicum (yellow avens)	1	0-1	5
Geum macrophyllum (large-leaved yellow avens)	1	0-1	5
Geum triflorum (three-flowered avens)	3	0-3	5
Glycyrrhiza lepidota (wild licorice)	1	0-1	5
Helianthus nuttallii (common tall sunflower)	1	0-1	5
Heterotheca villosa (golden aster)	1	0-1	5
Liatris punctata (dotted blazingstar)	1	0-1	5
Linum lewisii (wild blue flax)	1	0-1	10
Medicago lupulina (black medick)	4	0-10	20
Melilotus alba (white sweet-clover)	1	0-3	15
Melilotus officinalis (yellow sweet-clover)	1	0-1	5
Mentha arvensis (wild mint)	3	0-3	5
Monarda fistulosa (wild bergamot)	1	0-1	5
Oxytropis deflexa (reflexed locoweed)	3	0-3	5
Petasites sagittatus (arrow-leaved coltsfoot)	3	0-3	5
Plantago major (common plantain)	3	0-3	5
Potentilla bipinnatifida (plains cinquefoil)	1	0-1	5
Potentilla gracilis (graceful cinquefoil)	2	0-3	20
Potentilla pensylvanica (prairie cinquefoil)	10	0-10	5
Ranunculus acris (tall buttercup)	2	0-3	10
Sisymbrium loeselii (tall hedge mustard)	1	0-1	5
Sisyrinchium montanum (common blue-eyed grass)	1	0-1	5
Smilacina stellata (star-flowered Solomon's-seal)	3	0-10	30
Solidago canadensis (Canada goldenrod)	7	0-20	30
Solidago gigantea (late goldenrod)	5	0-10	15
Solidago missouriensis (low goldenrod)	3	0-3	5
Sonchus arvensis (perennial sow-thistle)	7	0-10	15
Sonchus asper (prickly annual sow-thistle)	10	0-20	10
Taraxacum officinale (common dandelion)	5	0-10	35
Thermopsis rhombifolia (golden bean)	13	0-20	20
Tragopogon dubius (common goat's-beard)	1	0-1	5
Trifolium repens (white clover)	11	0-20	15
Urtica dioica (common nettle)	1	0-1	5
Vicia americana (wild vetch)	1	0-1	20
Viola adunca (early blue violet)	3	0-3	5
Ferns and Allies			
Equisetum arvense (common horsetail)	3	0-3	10
Equisetum laevigatum (smooth scouring-rush)	1	0-1	10
Equisetum spp. (horsetail)	1	0-1	5

SUCCESSIONAL INFORMATION

The *Elaeagnus commutata* (silverberry) community type is an early seral successional stage that may in some situations be a grazing disclimax of the *Picea glauca/Cornus stolonifera* (white spruce/red-osier dogwood) habitat type, the *Acer negundo/Prunus virginiana* (Manitoba maple/choke cherry) habitat type, or one of the willow habitat types. On other sites, the *Elaeagnus commutata* (silverberry) community type may represent a long-lived mid-seral stage not influenced by heavy grazing pressures. Further work will seek insight into the ecological dynamics of this community type.

Disturbance Stages

Disturbance-related species such as *Rosa* species (rose), *Symphoricarpos occidentalis* (buckbrush), *Bromus inermis* (awnless brome), and *Poa pratensis* (Kentucky bluegrass) are generally associated with the *Elaeagnus commutata* (silverberry) community type. *Elaeagnus commutata* (silverberry) is generally not a preferred browse species, therefore only in extreme cases will livestock or wildlife utilize it, therefore it follows that the composition of stands of *Elaeagnus commutata* (silverberry) are rarely impacted by browsing.

SOILS

Soils are quite variable and include Regosols and Chernozems. The *Elaeagnus commutata* (silverberry) community type occurs on virtually all soil textures. This community type is tolerant of imperfectly drained soils and short duration floods, but is intolerant of prolonged floods and permanent high water tables.

ADJACENT COMMUNITIES

Adjacent wetter communities may include the *Populus balsamifera* (balsam poplar) series of community types, the *Salix exigua* (sandbar willow) community type, the *Acer negundo/Prunus virginiana* (Manitoba maple/choke cherry) habitat type, or one of the *Populus tremuloides* (aspen) dominated habitat types. Other adjacent wetter communities may include types dominated by *Salix lutea* (yellow willow) or *Salix bebbiana* (beaked willow), *Prunus virginiana* (choke cherry), or *Symphoricarpos occidentalis* (buckbrush). Adjacent drier communities are typically upland types.

MANAGEMENT INFORMATION

Livestock

Forage production for dense, monotypic stands of *Elaeagnus commutata* (silverberry) is low. As stands open, forage production increases accordingly due to the presence of *Agropyron smithii* (western wheat grass) and *Poa pratensis* (Kentucky bluegrass). The palatability of *Elaeagnus commutata* (silverberry) appears to be very low.

Wildlife

The moderate structural diversity of the *Elaeagnus commutata* (silverberry) community type provides thermal and hiding cover for big game and upland bird species. The palatability of *Elaeagnus commutata* (silverberry) is unknown for deer and elk. The persistent fruits are likely to have some wildlife value.

Fisheries

This community type offers streambank stabilization due to the rhizomatous nature of *Elaeagnus commutata* (silverberry), but otherwise little value for fish or fish habitat.

Fire

Elaeagnus commutata (silverberry) is probably killed by severe fires. *Elaeagnus commutata* (silverberry) sprouts from rhizomes after fire, and probably establishes from seed if dispersed onto burned sites. However, it does not recover quickly after fire. Numbers of *Elaeagnus commutata* (silverberry) may increase after fire, but cover usually decreases and recovers slowly. In the Canadian prairie, *Elaeagnus commutata* (silverberry) is listed as a species seriously harmed by spring and fall burns (USDA IFSL 1995).

Soil Management and Rehabilitation Opportunities

Elaeagnus commutata (silverberry) grows in dense colony stands makes it suitable for revegetating disturbed land, but there are usually better species to choose from the standpoint of forage and wildlife value. Once established, it grows at a moderate rate and spreads rapidly by root sprouts.

Recreational Uses and Considerations

The recreational value of *Elaeagnus commutata* (silverberry) is minimal beyond the pleasant aroma of the blossoms in the spring.

OTHER STUDIES

An *Elaeagnus commutata* (silverberry) community type is described by Lawrence and Romo (1994) on the Matador Research Station in southern Saskatchewan.

Prunus virginiana Community Type
(Choke Cherry Community Type)

PRUNVIR

Number Of Stands Sampled = 25

Number Of Stands Sampled in Saskatchewan = 10

LOCATION AND ASSOCIATED LANDFORMS

The *Prunus virginiana* (choke cherry) community type is a minor type at low to mid elevations along steams, rivers, lakes, and ponds in southern Saskatchewan. In some cases, stands are located on hillsides immediately below a spring or seep. The community type occurs as small dense thickets, narrow bands, or irregular patches.

VEGETATION

Undisturbed stands of the *Prunus virginiana* (choke cherry) community type form dense, monospecific thickets. When disturbance occurs, stands tend to open. Associated species in open stands may include *Symphoricarpos occidentalis* (buckbrush), *Rosa* species (rose), *Poa pratensis* (Kentucky bluegrass), *Bromus inermis* (awnless brome), *Urtica dioica* (common nettle), and *Smilacina stellata* (star-flowered Solomon's-seal) (Table 44).

Table 44. Average canopy cover, range of canopy cover, and constancy for species recorded in 9 sampled stands of the *Prunus virginiana* (choke cherry) community type relatively undisturbed by livestock grazing

TABLE 44.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Trees			
Populus balsamifera (balsam poplar)	2	0-3	22
Populus deltoides (plains cottonwood)	3	0-3	11
Populus tremuloides (aspen)	3	0-3	11
Shrubs			
Amelanchier alnifolia (Saskatoon)	7	0-10	44
Berberis repens (creeping mahonia)	1	0-1	11
Clematis ligusticifolia (western clematis)	3	0-3	11
Cornus canadensis (bunchberry)	3	0-3	11
Cornus stolonifera (red-osier dogwood)	15	0-20	22
Crataegus douglasii (Douglas hawthorn)	10	0-10	11
Crataegus rotundifolia (round-leaved hawthorn)	3	0-3	11
Lonicera dioica (twining honeysuckle)	3	0-3	11
Lonicera involucrata (bracted honeysuckle)	3	0-3	11
Prunus virginiana (choke cherry)	88	30-98	100
Rhus radicans (poison ivy)	3	0-3	11
Ribes americanum (wild black currant)	1	0-1	22
Ribes aureum (golden currant)	10	0-10	11
Ribes lacustre (bristly black currant)	1	0-1	22
Ribes oxyacanthoides (northern gooseberry)	1	0-1	22
Rosa spp. (rose)	4	0-10	78
Rubus idaeus (wild red raspberry)	2	0-3	22
Rubus pubescens (dewberry)	1	0-1	22
Symphoricarpos albus (snowberry)	3	0-3	11
Symphoricarpos occidentalis (buckbrush)	11	0-30	67
Viburnum edule (low-bush cranberry)	10	0-10	11
Graminoids			
Agropyron repens (quack grass)	1	0-1	11
Agropyron smithii (western wheat grass)	1	0-1	11

TABLE 44.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Bromus ciliatus (fringed brome)	1	0-1	11
Bromus inermis (awnless brome)	2	0-3	22
Calamagrostis canadensis (bluejoint)	10	0-10	11
Carex atherodes (awned sedge)	1	0-1	11
Carex backii (Back's sedge)	1	0-1	11
Carex sprengelii (Sprengel's sedge)	3	0-3	11
Elymus virginicus (Virginia wild rye)	5	0-10	22
Poa palustris (fowl bluegrass)	2	0-3	22
Poa pratensis (Kentucky bluegrass)	3	0-3	33
Puccinellia nuttalliana (Nuttall's salt-meadow grass)	1	0-1	11
Forbs			
Achillea millefolium (common yarrow)	1	0-1	11
Actaea rubra (red and white baneberry)	1	0-1	11
Aralia nudicaulis (wild sarsaparilla)	1	0-1	11
Arctium minus (common burdock)	1	0-1	11
Aster conspicuus (showy aster)	3	0-3	11
Cirsium arvense (Canada thistle)	1	0-1	11
Epilobium angustifolium (common fireweed)	1	0-1	11
Fragaria virginiana (wild strawberry)	1	0-1	11
Galium boreale (northern bedstraw)	1	0-1	11
Galium trifidum (small bedstraw)	1	0-1	11
Galium triflorum (sweet-scented bedstraw)	5	0-10	22
Hackelia americana (nodding stickseed)	1	0-1	11
Humulus lupulus (common hop)	3	0-3	11
Lathyrus ochroleucus (cream-colored vetchling)	3	0-3	11
Mertensia paniculata (tall lungwort)	1	0-1	11
Mitella nuda (bishop's-cap)	1	0-1	11
Monarda fistulosa (wild bergamot)	1	0-1	11
Pyrola asarifolia (common pink wintergreen)	1	0-1	11
Sanicula marilandica (snakeroot)	1	0-1	11
Smilacina racemosa (false Solomon's-seal)	1	0-1	22
Smilacina stellata (star-flowered Solomon's-seal)	10	0-20	22
Solidago canadensis (Canada goldenrod)	1	0-1	11
Solidago missouriensis (low goldenrod)	1	0-1	11
Solidago rigida (stiff goldenrod)	3	0-3	11
Taraxacum officinale (common dandelion)	1	0-1	11
Thalictrum occidentale (western meadow rue)	1	0-1	11
Urtica dioica (common nettle)	1	0-1	44
Vicia americana (wild vetch)	1	0-1	11
Viola spp. (violet)	1	0-1	11
Viola canadensis (western Canada violet)	2	0-3	22
Ferns and Allies			
Equisetum arvense (common horsetail)	3	0-3	11

SUCCESSIONAL INFORMATION

The *Prunus virginiana* (choke cherry) community type seems to represent a mid-seral grazing disclimax stage of the *Acer negundo/Prunus virginiana* (Manitoba maple/choke cherry) habitat type, the *Fraxinus pennsylvanica/Prunus virginiana* (green ash/choke cherry) habitat type, the *Populus tremuloides/Cornus stolonifera* (aspen/red-osier dogwood) habitat type, or a type dominated by the *Salix bebbiana/Cornus stolonifera* (beaked willow/red-osier dogwood) habitat type or the *Salix lutea/Cornus stolonifera* (yellow willow/red-osier dogwood) habitat type. Careful observation of site characteristics and remnant plant species will assist in the determination of site potential.

Increased disturbance of this type leads to increased *Rosa* species (rose), *Symphoricarpos occidentalis* (buckbrush), and *Poa pratensis* (Kentucky bluegrass). Excessive disturbance may result in large areas of exposed soil.

SOILS

Soils include Regosols and Chernozems. Texture ranges from silt to sandy loam. The *Prunus virginiana* (choke cherry) community type is most common on well-drained, older, more developed soils that afford good rooting depth and higher fertility. This type can tolerate weak salinity, but is intolerant of poor drainage and prolonged flooding.

ADJACENT COMMUNITIES

Adjacent wetter communities may include *Populus balsamifera* (balsam poplar) and *Populus deltoides* (plains cottonwood), *Salix exigua* (sandbar willow), *Salix lutea* (yellow willow), or *Salix amygdaloides* (peach-leaved willow) community types, or the *Acer negundo/Prunus virginiana* (Manitoba maple/choke cherry), the *Fraxinus pennsylvanica/Prunus virginiana* (green ash/choke cherry) or *Salix bebbiana/Carex atherodes* (beaked willow/awned sedge) habitat types. Adjacent drier communities typically are the *Artemisia cana/Agropyron smithii* (silver sagebrush/western wheat grass) habitat type, the *Rosa woodsii* (common wild rose) or *Symphoricarpos occidentalis* (buckbrush) community types, or upland communities.

MANAGEMENT INFORMATION

Livestock

In dense, monotypic stands, forage production from the *Prunus virginiana* (choke cherry) community type is low. The palatability of *Prunus virginiana* (choke cherry) ranges from poor to fair for both cattle and sheep, although livestock losses due to poisoning sometimes occur. Livestock normally do not eat fatal quantities except when other forage is scarce (Wasser 1982, Johnson and Nichols 1982).

Over the years, there has been some debate whether *Prunus virginiana* (choke cherry) leaves are poisonous to livestock. The leaves and seeds have sugars that contain cyanide. These cyanide sugars are not directly poisonous, but when the plant material is chewed and digested, enzymes cause the release of hydrogen cyanide (Ode Pers. Comm. 1987). In high concentrations, hydrogen cyanide is a metabolic poison to most animals. It has recently been shown that livestock can acquire the ability to detoxify hydrogen cyanide by consuming small amounts of it over an extended period. Therefore, *Prunus virginiana* (choke cherry) will poison livestock only if consumed in large quantity without prior conditioning.

Wildlife

The moderate structural diversity of the *Prunus virginiana* (choke cherry) community type provides thermal and hiding cover for livestock, big game, and upland bird species. *Prunus virginiana* (choke cherry) palatability rates fair to good as big game browse. In some instances, dwarfed and thinned communities can result from winter concentration of game animals. As stands open and herbaceous species increase due to disturbance, the forage value for livestock and wildlife increases accordingly. *Prunus virginiana* (choke cherry) is moderately tolerant of browsing.

Prunus virginiana (choke cherry) is among our most important wildlife food plants. Birds and mammals relish the fruits. This shrub is rated as one of the best sources of winter browse for deer and elk (Ode Pers. Comm. 1987). This is due to increased protein content in the stems during fall and winter. Furthermore, the leaves and stems are higher in carbohydrates, calcium, and phosphorus than other native shrubs.

Fisheries

Prunus virginiana (choke cherry) provides excellent thermal cover for fish and for controlling erosion along streams.

Fire

Prunus virginiana (choke cherry) will survive all but a hot, intense fire. The species has an aggressive root system and vigorously sprouts from surviving root crowns after fire (and occasionally from rhizomes). Plant frequencies typically increase on most sites in response to fire. Although aerial portions are readily killed, the majority of plants survive fire due to perennating buds located on root crowns and rhizomes. Generalized information indicates that choke cherry is well adapted to fire when fires occur during plant dormancy and under high soil moisture conditions (USDA IFSL 1995).

Soil Management and Rehabilitation Opportunities

Disturbed areas can be revegetated with *Prunus virginiana* (choke cherry), using nursery-grown stock or rooted cuttings. Adapted to a wide variety of sites, transplant success rates are typically high.

Recreational Uses and Considerations

The fruit of *Prunus virginiana* (choke cherry) is highly regarded for making wine and tasty jelly, but one must harvest ahead of the birds (Johnson and Nichols 1982). Aboriginal people ate the fruit fresh or preserved it by drying. In addition, they combined it with venison and buffalo meat to make mincemeat. They also used the berries for medicinal purposes.

Because of the density of branches, twigs, and heavy foliage, communities dominated by *Prunus virginiana* (choke cherry) provide excellent screens in recreation areas. Because of their fruits, they also provide excellent opportunities for viewing a variety of wildlife.

OTHER STUDIES

A *Prunus virginiana* (choke cherry) community type is described by Hansen and others (1995) for Montana, and a *Prunus virginiana* (choke cherry) community is described by Lawrence and Romo (1994) on the Matador Research Station in southern Saskatchewan.

Rosa woodsii Community Type
(Common Wild Rose Community Type)

ROSAWOO
Number Of Stands Sampled = 15
Number Of Stands Sampled in Saskatchewan = 1

CAUTION—Not all sites currently dominated by *Rosa woodsii* (common wild rose) are considered riparian or wetland sites. In some instances, they are considered upland sites. The topographic position of the site must match the description as presented in the Location and Associated Landform section.

Note: The *Rosa woodsii* (common wild rose) community type includes all combinations of *Rosa woodsii* (common wild rose) and *Rosa acicularis* (prickly rose) due to similarities in environmental conditions and management concerns.

LOCATION AND ASSOCIATED LANDFORMS

The *Rosa woodsii* (common wild rose) community type is a minor type in southern Saskatchewan. It occurs on alluvial terraces along streams and rivers. Stands are also located in V-shaped ravines and swale-like depressions where overland flows provide additional moisture. Stands may also be located on slopes immediately below a spring or seep, or where blown snow accumulates.

VEGETATION

The *Rosa woodsii* (common wild rose) community type represents a grazing disclimax. It usually forms dense, impenetrable stands. In some instances, the stands contain only *Rosa* species (rose); however, in most cases, stands take on a two-layer appearance. The upper layer is comprised of *Rosa* species (rose). The second layer, which is only slightly shorter than the *Rosa* species (rose) layer, is comprised of dense clones of *Symphoricarpos occidentalis* (buckbrush). Any herbaceous layer is likely to be dominated by *Poa pratensis* (Kentucky bluegrass) (Table 45).

Table 45. Average canopy cover, range of canopy cover, and constancy for species recorded in 15 sampled stands of the grazing disclimax *Rosa woodsii* (common wild rose) community type

TABLE 45.	**% Can. Cov.**		
Species	**Avg.**	**Rng.**	**Con.**
Trees			
Acer negundo (Manitoba maple)	3	0-3	7
Fraxinus pennsylvanica (green ash)	1	0-1	13
Shrubs			
Chrysothamnus viscidiflorus (green rabbitbrush)	1	0-1	7
Clematis ligusticifolia (western clematis)	3	0-3	7
Cornus stolonifera (red-osier dogwood)	2	0-3	13
Elaeagnus commutata (silverberry)	2	0-3	20
Parthenocissus quinquefolia (Virginia creeper)	1	0-1	7
Rhus radicans (poison ivy)	8	0-20	20
Rhus trilobata (skunkbush)	2	0-3	13
Ribes aureum (golden currant)	7	0-20	20
Ribes oxyacanthoides (northern gooseberry)	1	0-1	20
Rosa acicularis (prickly rose)	50	0-50	7
Rosa woodsii (common wild rose)	40	0-80	47
Rosa spp. (rose)	77	0-90	47
Salix amygdaloides (peach-leaved willow)	3	0-3	7
Salix exigua (sandbar willow)	5	0-20	33
Shepherdia argentea (thorny buffaloberry)	2	0-3	13
Symphoricarpos occidentalis (buckbrush)	35	3-80	100
Graminoids			
Agropyron repens (quack grass)	3	0-3	33
Agropyron smithii (western wheat grass)	7	0-20	33
Agrostis stolonifera (redtop)	3	0-3	20
Agropyron trachycaulum (slender wheat grass)	3	0-3	7
Bromus inermis (awnless brome)	16	0-40	47
Carex lanuginosa (woolly sedge)	3	0-3	7
Elymus canadensis (Canada wild rye)	2	0-3	40
Juncus balticus (wire rush)	1	0-1	7
Muhlenbergia racemosa (marsh muhly)	2	0-3	27
Poa palustris (fowl bluegrass)	1	0-1	7
Poa pratensis (Kentucky bluegrass)	27	0-60	33
Poa spp. (bluegrass)	8	0-20	20
Stipa comata (needle-and-thread)	1	0-1	7
Forbs			
Achillea millefolium (common yarrow)	1	0-1	7
Allium cernuum (nodding onion)	1	0-1	7
Artemisia dracunculus (dragonwort)	1	0-1	7
Artemisia ludoviciana (prairie sagewort)	1	0-1	13
Asclepias speciosa (showy milkweed)	2	0-3	13
Asclepias verticillata (whorled milkweed)	3	0-3	7
Asparagus officinalis (asparagus)	1	0-1	13
Aster hesperius (western willow aster)	1	0-1	13
Campanula rotundifolia (harebell)	1	0-1	7
Cirsium arvense (Canada thistle)	3	0-3	20
Cynoglossum officinale (hound's-tongue)	1	0-1	7
Erysimum cheiranthoides (wormseed mustard)	3	0-3	7
Galium boreale (northern bedstraw)	1	0-1	7
Glycyrrhiza lepidota (wild licorice)	3	0-10	33
Helianthus couplandii (Coupland's annual sunflower)	1	0-1	7
Humulus lupulus (common hop)	40	0-40	7
Medicago lupulina (black medick)	10	0-10	7
Melilotus officinalis (yellow sweet-clover)	1	0-1	7
Physalis heterophylla (yellow ground-cherry)	3	0-3	7
Rumex crispus (curled dock)	1	0-1	7
Senecio spp. (senecio)	1	0-1	7
Smilacina stellata (star-flowered Solomon's-seal)	1	0-1	13
Solidago canadensis (Canada goldenrod)	5	0-10	20
Solidago gigantea (late goldenrod)	7	0-10	13

TABLE 45.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Sonchus asper (prickly annual sow-thistle)	1	0-1	7
Thermopsis rhombifolia (golden bean)	1	0-1	7
Urtica dioica (common nettle)	10	0-20	13
Vicia americana (wild vetch)	4	0-10	20
Ferns and Allies			
Equisetum laevigatum (smooth scouring-rush)	1	0-1	7

SUCCESSIONAL INFORMATION

In southern Saskatchewan, the *Rosa woodsii* (common wild rose) community type is most likely to represent a mid-seral grazing disclimax of the *Fraxinus pennsylvanica/Prunus virginiana* (green ash/choke cherry) habitat type, the *Acer negundo/Prunus virginiana* (Manitoba maple/choke cherry) habitat type, the *Populus tremuloides/Cornus stolonifera* (aspen/red-osier dogwood) habitat type, the *Salix bebbiana/Cornus stolonifera* (beaked willow/red-osier dogwood) habitat type, or the *Salix lutea/Cornus stolonifera* (yellow willow/red-osier dogwood) habitat type. Careful observation of site characteristics and remnant plant species will assist in the determining site potential.

The thorny nature of *Rosa* species (rose) precludes many forms of disturbance. However, if the dense overstory is opened up, disturbance-related species such as *Poa pratensis* (Kentucky bluegrass) or *Bromus inermis* (awnless brome) will invade and increase.

SOILS

Soils vary from dry, young Regosols to more well-developed Chernozems. Texture varies from silt loam to sandy loam. Soils are commonly well drained and nonsaline. *Rosa woodsii* (common wild rose) is intolerant of poor drainage, high water tables, and prolonged flooding (Wasser 1982).

ADJACENT COMMUNITIES

Adjacent wetter communities may include the cottonwood, *Salix exigua* (sandbar willow), or *Salix amygdaloides* (peach-leaved willow) community types, the *Acer negundo/Prunus virginiana* (Manitoba maple/choke cherry) or the *Populus tremuloides/Cornus stolonifera* (aspen/red-osier dogwood) habitat types, or a type dominated by *Salix bebbiana* (beaked willow) or *Salix lutea* (yellow willow). Adjacent drier communities are typically dominated by upland species.

MANAGEMENT INFORMATION

Livestock

Forage production from dense thickets of the *Rosa woodsii* (common wild rose) community type is low. Stands may be so dense that they exclude most livestock use. However, the leaves of *Rosa woodsii* (common wild rose) are considered fair to fairly good livestock forage, particularly for sheep (Johnson and Nichols 1982).

Wildlife

Stands of the *Rosa woodsii* (common wild rose) community type provide good structural diversity for thermal and hiding cover. Deer and elk may browse heavily on *Rosa woodsii* (common wild rose), and the persistent fruit (hips) provides fall and winter food for birds, small mammals, and bears, which disperse the seeds. *Rosa woodsii* (common wild rose) is strongly grazing tolerant but can be dwarfed and thinned by intense browsing or defoliation during season long use.

Fire

Rosa woodsii (common wild rose) is strongly fire tolerant, except for smouldering fires with heavy volumes of surface fuel. The species has a shallow and much branched rhizomatous root system that will readily sprout and sucker. This sprouting capability of *Rosa woodsii* (common wild rose) makes it a good soil stabilizer. This is especially important given the severe disturbance common to areas colonized by this community type.

Rosa woodsii (common wild rose) is typically top-killed by fire. Root crowns and underground rhizomes survive low- or moderate-severity fires. However, the shallow root crowns are susceptible to injury, and populations consequently decrease following high-severity fire. *Rosa woodsii* (common wild rose) is usually favoured by low-severity fire. It can persist after low- to moderate-severity fire because of its ability to sprout from undamaged or buried root crowns and rhizomes (USDA IFSL 1995).

Soil Management and Rehabilitation Opportunities

Rosa woodsii (common wild rose) is valuable for revegetating disturbed sites along streambanks and seeps. It is easily established from nursery-grown stock, root cuttings, or transplanted materials.

Recreational Uses and Considerations

The persistent rose hips are edible, and are one of the best natural sources of vitamin C. They can be dried for use in flavouring teas, jellies, fruitcakes, and puddings.

Nature trails should be routed around dense stands of this community type. However, *Rosa woodsii* (common wild rose) is useful for planting in recreation areas as a biological barrier to protect physical structures, young and delicate plants, or to direct traffic.

OTHER STUDIES

A *Rosa woodsii* (common wild rose) community type is described by Hansen and others (1995) for Montana, and a *Rosa* species (rose) community is described by Lawrence and Romo (1994) on the Matador Research Station in southern Saskatchewan. Michalsky and others (1994) describe a Rose-Buckbrush vegetation type on the Grasslands National Park in extreme southern Saskatchewan.

Sarcobatus vermiculatus/Agropyron smithii Habitat Type

(Greasewood/Western Wheat Grass Habitat Type)

SARCVER/AGROSMI
Number Of Stands Sampled = 14
Number Of Stands Sampled in Saskatchewan = 3

LOCATION AND ASSOCIATED LANDFORMS

The *Sarcobatus vermiculatus/Agropyron smithii* (greasewood/western wheat grass) habitat type occupies nearly level, older alluvial terraces on floodplains and coalescing alluvial fans in valleys. It may also occur on rather broad expanses along flat lakeshores and playas. It is an incidental type in southwestern Saskatchewan, which represents the northern extent of its range. This habitat type represents one of the driest extremes of the riparian or wetland zone. Sites are found where either overland flow or soil conditions (fine textured, poorly drained saline or alkaline), or a combination of both, provide a moisture regime that exceeds the incident precipitation. In many situations, the fine textured soils have resulted in a perched water table.

VEGETATION

Floristically, sites appear similar to the *Artemisia cana/Agropyron smithii* (silver sagebrush/western wheat grass) habitat type with the substitution of *Sarcobatus vermiculatus* (greasewood) for *Artemisia cana* (silver sagebrush). *Sarcobatus vermiculatus* (greasewood) dominates the shrub layer and *Agropyron smithii* (western wheat grass) dominates the herbaceous layer. Canopy cover of *Sarcobatus vermiculatus* (greasewood) is low, yet the stature of the plant compared to associated vegetation creates a shrubland appearance. *Sarcobatus vermiculatus* (greasewood) is among the most alkali tolerant of the native shrubs (Johnson and Nichols 1982) (Table 46).

Table 46. Average canopy cover, range of canopy cover, and constancy for species recorded in 14 stands of the *Sarcobatus vermiculatus/Agropyron smithii* (greasewood/western wheat grass) habitat type

TABLE 46.	**% Can. Cov.**		
Species	**Avg.**	**Rng.**	**Con.**
Shrubs			
Artemisia cana (silver sagebrush)	1	0-1	29
Atriplex nuttallii (Nuttall's atriplex)	1	0-1	7
Sarcobatus vermiculatus (greasewood)	35	20-60	100
Graminoids			
Agropyron pectiniforme (crested wheat grass)	2	0-3	14
Agropyron smithii (western wheat grass)	56	0-98	79
Bouteloua gracilis (blue grama)	7	0-20	21
Bromus japonicus (Japanese chess)	57	0-80	43
Bromus tectorum (downy chess)	12	0-20	14
Carex filifolia (thread-leaved sedge)	20	0-20	7
Distichlis stricta (salt grass)	25	0-60	36
Hordeum jubatum (foxtail barley)	17	0-60	29
Poa canbyi (Canby bluegrass)	20	0-20	14
Poa juncifolia (alkali bluegrass)	80	0-80	7
Poa pratensis (Kentucky bluegrass)	40	0-80	29
Poa sandbergii (Sandberg bluegrass)	3	0-3	7
Puccinellia nuttalliana (Nuttall's salt-meadow grass)	34	0-80	21
Sporobolus cryptandrus (sand dropseed)	1	0-1	7
Stipa comata (needle-and-thread)	2	0-3	14
Stipa viridula (green needle grass)	3	0-3	14
Forbs			
Achillea millefolium (common yarrow)	10	0-20	14
Artemisia frigida (pasture sagewort)	2	0-3	14
Atriplex argentea (silver saltbush)	3	0-3	7
Camelina microcarpa (small-seeded false flax)	3	0-3	14
Chenopodium album (lamb's-quarters)	3	0-3	7
Chenopodium fremontii (Fremont's goosefoot)	1	0-1	14
Chenopodium leptophyllum (narrow-leaved goosefoot)	3	0-3	7
Cirsium arvense (Canada thistle)	20	0-20	7
Descurainia pinnata (green tansy mustard)	60	0-60	7
Grindelia squarrosa (gumweed)	1	0-1	7
Kochia scoparia (summer-cypress)	1	0-1	14
Lactuca serriola (prickly lettuce)	3	0-3	7
Opuntia fragilis (brittle prickly-pear)	1	0-1	7
Opuntia polyacantha (prickly-pear)	6	0-20	29
Sisymbrium loeselii (tall hedge mustard)	1	0-1	7
Suaeda calceoliformis (western sea-blite)	30	0-30	7
Taraxacum officinale (common dandelion)	10	0-20	14
Tragopogon dubius (common goat's-beard)	2	0-3	29

SUCCESSIONAL INFORMATION

Continued overgrazing reduces the amounts of *Agropyron smithii* (western wheat grass) while allowing *Sarcobatus vermiculatus* (greasewood), *Bouteloua gracilis* (blue grama), *Poa pratensis* (Kentucky bluegrass), *Bromus tectorum* (downy chess), and *Hordeum jubatum* (foxtail barley) increase. Heavy spring and summer grazing will cause a decrease in *Sarcobatus vermiculatus* (greasewood).

SOILS

Soils are poorly drained, saline, or alkaline. Texture ranges from silt to clay. *Sarcobatus Vermiculatus* (greasewood) is among the most alkali tolerant native shrubs (Johnson and Nichols 1982). *Sarcobatus vermiculatus* (greasewood) can tolerate surface flooding for up to 40 days before showing effects of low oxygen concentration in the rooting zone. High water tables are common, typically within 25 to 30 cm (10 to 12 in) of the soil surface.

ADJACENT COMMUNITIES

Adjacent wetter sites may be the *Distichlis stricta* (salt grass) habitat type, or the *Acer negundo/Prunus virginiana* (Manitoba maple/choke cherry) habitat types. In other situations, cottonwoods or willows may dominate wetter sites. Adjacent drier sites are dominated by a variety of upland shrub and/or grassland communities.

MANAGEMENT INFORMATION

Livestock

Forage production of the *Sarcobatus vermiculatus/Agropyron smithii* (greasewood/western wheat grass) habitat type ranges from low to moderate, depending on abundance of palatable grasses. Although not very palatable, *Sarcobatus vermiculatus* (greasewood) may be browsed by cattle in the winter (Mueggler and Stewart 1980, Johnson and Nichols 1982). Herbage has a high alkaline content making it advisable to augment *Sarcobatus vermiculatus* (greasewood) forage with additional feed and to provide adequate water. *Sarcobatus vermiculatus* (greasewood) is moderately poisonous to sheep and cattle. Sheep are often poisoned in the fall by eating large amounts of fallen leaves. Toxicity increases in the fall as the plants mature. Leaves contain oxalates of potassium and sodium, which can kill livestock in four to six hours after being eaten. Sheep may die from eating two pounds of leaves while cattle may survive up to three to four pounds of these leaves. Heavy spring and summer grazing will cause a decrease in *Sarcobatus vermiculatus* (greasewood).

Agropyron smithii (western wheat grass) is highly desired by livestock. *Agropyron smithii* (western wheat grass) is palatable and nutritious when green in the spring, and moderately so at other times of the year (Johnson and Nichols 1982). Vigorous rhizomes make this species one of the more tolerant to grazing pressure and drought of the desirable and abundant grasses. However, overgrazing in May and June will decrease its abundance. When growing conditions improve, as is the case following drought or overgrazing, it may rapidly recolonize areas previously occupied.

Wildlife

Although not very palatable, *Sarcobatus vermiculatus* (greasewood) may be browsed somewhat by deer and antelope in the winter (Mueggler and Stewart 1980, Johnson and Nichols 1982). *Agropyron smithii* (western wheat grass) is palatable and nutritious in the spring, and moderately so at other times of the year (Johnson and Nichols 1982).

The low to moderate structural diversity of the *Sarcobatus vermiculatus/Agropyron smithii* (greasewood/western wheat grass) habitat type provides limited thermal and hiding cover for ungulates and upland bird species. Big game use of this habitat type occurs primarily during winter months (Mackie 1970).

Fire

Sarcobatus vermiculatus (greasewood) is described as "slightly damaged to unharmed" by fire. Plants are rarely killed even when fire consumes aboveground vegetation, generally sprouting vigorously from the stem base or roots (USDA IFSL 1995). Rapid resprouting may lead to an increase in stem density. *Agropyron smithii* (western wheat grass) has a good tolerance to fire in the dormant state. It usually survives fires during the growing season but recovery may be delayed (Wasser 1982).

Soil Management and Rehabilitation Opportunities
Care must be taken with road building across the *Sarcobatus vermiculatus/Agropyron smithii* (greasewood/western wheat grass) habitat type. Soils typically have a high clay content, causing problems with roadbed stability and travel when wet. Many motorists have learned the hard way why locals do not drive across this habitat type during or just after a rain.

Sarcobatus vermiculatus (greasewood) may be appropriate in revegetating disturbed sites having saline or alkaline soils and high water tables. However, nursery-grown stock or transplanted wildlings may be difficult to establish in the field. Growth rates are typically slow. A deep rooting habit makes this species a good soil stabilizer.

Commonly used herbicides defoliate *Sarcobatus vermiculatus* (greasewood), but they usually resprout causing the species to be a difficult one to control.

Agropyron smithii (western wheat grass) is potentially valuable for revegetating disturbed or degraded riparian or wetland sites. Using transplants will speed the recovery process, as seedlings are typically slow growing. Once established, plants will quickly spread by rhizomes.

OTHER STUDIES

The *Sarcobatus vermiculatus/Agropyron smithii* (greasewood/western wheat grass) habitat type is described by Hansen and others (1995) for eastern Montana. That description was an expanded description of the *Sarcobatus vermiculatus/Agropyron smithii* (greasewood/western wheat grass) habitat type as defined by Hansen and Hoffman (1988). This habitat type also has been described by Mueggler and Stewart (1980) and Mackie (1970) for portions of central and eastern Montana. Jorgensen (1979) described a similar habitat type for the Yellow Triangle region of Montana with the difference being the substitution of the ecologically similar *Agropyron dasystachyum* (northern wheat grass) for *Agropyron smithii* (western wheat grass). Michalsky and others (1994) describe a Greasewood/Rillscale vegetation type on the Grasslands National Park in extreme southern Saskatchewan.

***Shepherdia argentea* Community Type**
(Thorny Buffaloberry Community Type)

SHEPARG
Number Of Stands Sampled = 28
Number Of Stands Sampled in Saskatchewan = 7

LOCATION AND ASSOCIATED LANDFORMS

The *Shepherdia argentea* (thorny buffaloberry) community type is a minor type at low elevations in the Mixed Grassland Ecoregion of southern Saskatchewan. It occurs on alluvial floodplain terraces along streams and rivers throughout the region. Stands can be found along the South Saskatchewan, and Qu'Appelle Rivers. Stands are also located in V-shaped ravines and swale-like depressions where overland flows provide additional moisture. In some cases, stands may also be located on hillsides immediately below a spring or seep.

VEGETATION

The *Shepherdia argentea* (thorny buffaloberry) community type is recognized by dominance of the spine tipped shrub *Shepherdia argentea* (thorny buffaloberry), which forms dense, nearly impenetrable thickets, often exceeding 2 m (6.5 ft) tall. The sparse understory shrub layer generally consists of *Symphoricarpos occidentalis* (buckbrush) and *Rosa* species (rose). The herbaceous understory is characterized by *Poa pratensis* (Kentucky bluegrass) and *Parietaria pensylvanica* (American pellitory) (Table 47).

Table 47. Average canopy cover, range of canopy cover, and constancy for species recorded in 28 sampled stands of the grazing disclimax *Shepherdia argentea* (thorny buffaloberry) community type

TABLE 47.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Trees			
Populus angustifolia (narrow-leaf cottonwood)	1	0-1	4
Populus balsamifera (balsam poplar)	1	0-1	4
Shrubs			
Amelanchier alnifolia (Saskatoon)	3	0-3	14
Clematis ligusticifolia (western clematis)	2	0-3	14
Cornus stolonifera (red-osier dogwood)	7	0-10	11
Crataegus rotundifolia (round-leaved hawthorn)	3	0-3	4
Juniperus horizontalis (creeping juniper)	3	0-3	4
Prunus virginiana (choke cherry)	11	0-30	14
Rhus radicans (poison ivy)	4	0-10	18
Rhus trilobata (skunkbush)	3	0-3	7
Ribes americanum (wild black currant)	20	0-20	4
Ribes aureum (golden currant)	35	0-60	14
Ribes oxyacanthoides (northern gooseberry)	1	0-3	29
Rosa acicularis (prickly rose)	3	0-3	4
Rosa woodsii (common wild rose)	15	0-60	32
Rosa spp. (rose)	15	0-70	50
Rubus idaeus (wild red raspberry)	15	0-20	7
Salix exigua (sandbar willow)	1	0-1	4
Salix lutea (yellow willow)	2	0-3	18
Sarcobatus vermiculatus (greasewood)	3	0-3	4
Shepherdia argentea (thorny buffaloberry)	76	40-98	100
Symphoricarpos occidentalis (buckbrush)	37	1-80	100
Graminoids			
Agropyron repens (quack grass)	1	0-1	4
Agropyron smithii (western wheat grass)	2	0-3	29
Agrostis stolonifera (redtop)	17	0-60	14
Agropyron trachycaulum (slender wheat grass)	12	0-20	21
Andropogon gerardii (big bluestem)	3	0-3	4
Bouteloua gracilis (blue grama)	3	0-3	4
Bromus inermis (awnless brome)	16	0-80	29
Bromus japonicus (Japanese chess)	40	0-40	4
Carex filifolia (thread-leaved sedge)	3	0-3	4
Elymus virginicus (Virginia wild rye)	17	0-30	7
Juncus balticus (wire rush)	2	0-3	7
Koeleria macrantha (June grass)	3	0-3	4
Phalaris arundinacea (reed canary grass)	3	0-3	4
Phleum pratense (timothy)	3	0-3	4
Poa interior (inland bluegrass)	3	0-3	4
Poa pratensis (Kentucky bluegrass)	33	0-80	68
Poa spp. (bluegrass)	1	0-1	4
Stipa viridula (green needle grass)	1	0-1	7
Forbs			
Achillea millefolium (common yarrow)	9	0-40	39
Anemone canadensis (Canada anemone)	3	0-3	11
Apocynum cannabinum (Indian hemp)	1	0-1	4
Arctium minus (common burdock)	5	0-10	14
Artemisia frigida (pasture sagewort)	3	0-3	18
Artemisia ludoviciana (prairie sagewort)	2	0-3	29
Aster borealis (marsh aster)	1	0-1	4
Aster laevis (smooth aster)	3	0-3	4
Aster subspicatus (leafy-bracted aster)	1	0-1	4
Carduus nutans (nodding thistle)	1	0-1	4
Chenopodium album (lamb's-quarters)	3	0-3	7
Chenopodium capitatum (strawberry blite)	20	0-20	4
Chenopodium fremontii (Fremont's goosefoot)	1	0-1	4
Chenopodium salinum (oak-leaved goosefoot)	3	0-3	4
Cicuta maculata (water-hemlock)	1	0-1	4

TABLE 47.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Cirsium arvense (Canada thistle)	12	0-40	25
Cirsium undulatum (wavy-leaved thistle)	3	0-3	4
Convolvulus arvensis (field bindweed)	3	0-3	7
Convolvulus sepium (wild morning-glory)	1	0-1	4
Cynoglossum officinale (hound's-tongue)	1	0-1	4
Erigeron acris (northern daisy fleabane)	10	0-10	4
Euphorbia esula (leafy spurge)	3	0-3	4
Unknown Forb	2	0-3	7
Galium aparine (cleavers)	20	0-20	11
Galium boreale (northern bedstraw)	11	0-30	18
Galium triflorum (sweet-scented bedstraw)	1	0-1	7
Geranium richardsonii (wild white geranium)	1	0-1	4
Geum macrophyllum (large-leaved yellow avens)	3	0-3	4
Glycyrrhiza lepidota (wild licorice)	2	0-3	21
Grindelia squarrosa (gumweed)	1	0-1	4
Hackelia americana (nodding stickseed)	5	0-10	11
Heracleum lanatum (cow parsnip)	1	0-1	4
Lactuca pulchella (common blue lettuce)	3	0-3	4
Lappula squarrosa (bluebur)	2	0-3	11
Liatris punctata (dotted blazingstar)	1	0-1	4
Medicago lupulina (black medick)	1	0-1	4
Melilotus officinalis (yellow sweet-clover)	3	0-3	4
Monarda fistulosa (wild bergamot)	7	0-20	21
Nepeta cataria (catnip)	2	0-3	14
Parietaria pensylvanica (American pellitory)	27	0-80	39
Salsola kali (Russian-thistle)	1	0-1	4
Sanicula marilandica (snakeroot)	3	0-3	7
Sisymbrium loeselii (tall hedge mustard)	2	0-3	7
Smilacina racemosa (false Solomon's-seal)	3	0-3	4
Smilacina stellata (star-flowered Solomon's-seal)	3	0-3	18
Solidago canadensis (Canada goldenrod)	5	0-10	11
Solidago gigantea (late goldenrod)	10	0-30	11
Sonchus arvensis (perennial sow-thistle)	5	0-10	7
Sonchus spp. (sow-thistle)	1	0-1	4
Taraxacum officinale (common dandelion)	2	0-3	14
Thalictrum venulosum (veiny meadow rue)	3	0-3	4
Trifolium aureum (yellow clover)	1	0-1	4
Urtica dioica (common nettle)	4	0-10	18
Vicia americana (wild vetch)	2	0-3	18
Viola adunca (early blue violet)	3	0-3	4
Ferns and Allies			
Equisetum arvense (common horsetail)	1	0-1	4
Equisetum laevigatum (smooth scouring-rush)	3	0-3	4
Equisetum sylvaticum (woodland horsetail)	1	0-1	4

SUCCESSIONAL INFORMATION

The successional dynamic of the *Shepherdia argentea* (thorny buffaloberry) community type is not well understood at this time because no stands were found that were clearly undisturbed by human causes. Although *Shepherdia argentea* (thorny buffaloberry) is native, we believe that most stands of this community type represent a mid-seral grazing disclimax of the *Acer negundo/Prunus virginiana* (Manitoba maple/choke cherry), the Fraxinus *pennsylvanica/Prunus virginiana* (green ash/choke cherry) habitat type, or possibly of the *Salix bebbiana/Cornus stolonifera* (beaked willow/red-osier dogwood) habitat type or the *Salix lutea/Cornus stolonifera* (yellow willow/red-osier dogwood) habitat type. Careful observation of site characteristics and remnant plant species will assist in the determination of the site potential. There is some reason to believe that this type may represent site potential on certain sites with slightly saline soils.

Prolonged disturbance by livestock and/or deer opens the stand, thereby allowing invasion by such disturbance increaser species as *Symphoricarpos occidentalis* (buckbrush), *Monarda fistulosa* (wild bergamot), and *Taraxacum officinale* (common dandelion).

SOILS

Soils are generally Regosols and Chernozems. The *Shepherdia argentea* (thorny buffaloberry) community type occurs on a wide range of soils but is most common in moist to seasonally wet, well drained, fine textured soils. It seems to be tolerant of imperfect drainage and some flooding, but intolerant of prolonged flooding and permanently high water tables.

ADJACENT COMMUNITIES

Adjacent wetter communities may include any of the *Populus deltoides* (plains cottonwood) series, the *Salix exigua* (sandbar willow), or *Salix amygdaloides* (peach-leaved willow) community types, or the *Acer negundo/Prunus virginiana* (Manitoba maple/choke cherry) or Fraxinus *pennsylvanica/Prunus virginiana* (green ash/choke cherry) habitat types. Some wetter communities may include the *Salix lutea* (yellow willow) dominated habitat types. Upland communities typically dominate adjacent drier communities.

Adjacent wetter communities may include *Acer negundo/Prunus virginiana* (Manitoba maple/choke cherry) or *Fraxinus pennsylvanica/Prunus virginiana* (green ash/choke cherry), habitat or types dominated by *Salix bebbiana* (beaked willow) or *Salix lutea* (yellow willow), or the cottonwood, *Salix exigua* (sandbar willow), or *Salix amygdaloides* (peach-leaved willow) community types. Adjacent drier communities may be dominated by *Bromus inermis* (awnless brome), *Symphoricarpos occidentalis* (buckbrush), *Rosa* species (rose), or upland communities.

MANAGEMENT INFORMATION

Livestock

The *Shepherdia argentea* (thorny buffaloberry) community type is strongly resistant to grazing and browsing pressures due to thorny branches. Forage production for the dense, thorny, monotypic stands is quite low. As stands open, forage production increases due to the increase of *Poa pratensis* (Kentucky bluegrass). The palatability of *Shepherdia argentea* (thorny buffaloberry) is generally poor for cattle and poor to fair for sheep.

Wildlife

The high structural diversity of the *Shepherdia argentea* (thorny buffaloberry) community type provides both thermal and hiding cover for livestock, big game, and upland bird species. Most stands have large numbers of animal trails. *Shepherdia argentea* (thorny buffaloberry) is a valuable forage species for mule deer and pronghorn. It is browsed by mule deer in Montana and in North Dakota. *Shepherdia argentea* (thorny buffaloberry) is an important browse species in mule deer winter diets (USDA IFSL 1995).

In Montana, North Dakota, and South Dakota, *Shepherdia argentea* (thorny buffaloberry) fruits are eaten by sharp-tailed grouse, cedar waxwings, other passerine species, and small mammals. In the northern Great Plains, the fruit provides the best native winter food source for sharp-tailed grouse. In Montana, sharp-tailed grouse feed primarily on silver buffaloberry buds in the winter (USDA IFSL 1995). Loggerhead shrikes utilize this type for nesting and foraging (Bristol 2000).

Fire

Shepherdia argentea (thorny buffaloberry) is fairly fire tolerant in the dormant state due to sprouting rootstocks (Wasser 1982). It sprouts from the root crown following fire, but varying responses to fire have been reported. In northern mixed-grass prairies, *Shepherdia argentea* (thorny buffaloberry) percent cover decreased after spring and summer fires. In the northern Great Plains, prescribed fire may be useful for opening up shrub thickets or for triggering sprout reproduction of remnant shrubs in failing stands (USDA IFSL 1995).

Soil Management and Rehabilitation Opportunities

Shepherdia argentea (thorny buffaloberry) is adapted to revegetating disturbed sites having well drained saline or alkaline soils. Nursery grown stock is readily established and growth rates are moderate. Once established, this community type provides excellent soil stabilization.

Recreational Uses and Considerations

Recreational opportunities in this type are good to excellent for hunting deer and upland birds. These sites are also excellent areas for observing many other wildlife species. *Shepherdia argentea* (thorny buffaloberry) may be valuable for plantings where a barrier is desired. The fruits are quite tasty and are eaten by birds and small animals. Aboriginal people and European pioneers preserved the fruits for eating by drying. Today, many people use the fruits to make excellent pies, jams, and jellies.

OTHER STUDIES

A *Shepherdia argentea* (thorny buffaloberry) community type is described by Hansen and others (1995) for Montana. Similar communities have been described for the northern Great Plains (Boldt and others 1978, Nelson 1961, Severson and Boldt 1978, Hansen and Hoffman 1988). A *Shepherdia argentea* (thorny buffaloberry) community is described by Lawrence and Romo (1994) on the Matador Research Station in southern Saskatchewan.

***Symphoricarpos occidentalis* Community Type (Buckbrush Community Type)**

SYMPOCC

Number Of Stands Sampled = 29

Number Of Stands Sampled in Saskatchewan = 8

CAUTION—Not all sites currently dominated by *Symphoricarpos occidentalis* (buckbrush) are considered riparian or wetland sites. In some instances, they are considered upland sites. The topographic position of the site must match the description as presented in the Location and Associated Landform section.

LOCATION AND ASSOCIATED LANDFORMS

The *Symphoricarpos occidentalis* (buckbrush) community type is a major type at low to mid elevations in the Grassland Ecoregions of southern Saskatchewan, and a minor type in the Cypress Upland and Aspen Parkland Ecoregions. It occurs on alluvial floodplain terraces along streams and rivers, in V-shaped ravines and swale-like depressions where overland flows provide additional moisture, and in some cases, stands may be located on the hillsides immediately below a spring or seep or where blown snow accumulates.

VEGETATION

Typically, the roots of *Symphoricarpos occidentalis* (buckbrush) are densely branched and mostly near the soil surface. The species spreads by stout rhizomes to form dense thickets. The large, dense patches thrive in full sunlight and often exclude most other species except the common companion *Rosa* species (rose). Undergrowth is comprised principally of *Poa pratensis* (Kentucky bluegrass), which increases with disturbance as the stands become more open (Table 48).

Table 48. Average canopy cover, range of canopy cover, and constancy for species recorded in 29 sampled stands of the *Symphoricarpos occidentalis* (buckbrush) community type

TABLE 48.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Trees			
Fraxinus pennsylvanica (green ash)	1	0-1	3
Shrubs			
Crataegus rotundifolia (round-leaved hawthorn)	1	0-1	3
Elaeagnus commutata (silverberry)	3	0-3	7
Juniperus horizontalis (creeping juniper)	90	0-90	3
Juniperus scopulorum (Rocky Mountain juniper)	1	0-1	3
Potentilla fruticosa (shrubby cinquefoil)	1	0-1	3
Ribes aureum (golden currant)	3	0-3	7
Ribes oxyacanthoides (northern gooseberry)	1	0-3	10
Rosa acicularis (prickly rose)	10	0-20	7
Rosa woodsii (common wild rose)	7	0-20	14
Rosa spp. (rose)	4	0-20	55
Salix exigua (sandbar willow)	1	0-1	3
Symphoricarpos occidentalis (buckbrush)	78	10-98	100
Graminoids			
Agropyron repens (quack grass)	5	0-10	7
Agropyron smithii (western wheat grass)	15	0-80	24
Agrostis stolonifera (redtop)	40	0-40	3
Agropyron trachycaulum (slender wheat grass)	3	0-3	10
Bouteloua gracilis (blue grama)	1	0-1	3
Bromus carinatus (keeled brome)	1	0-1	3
Bromus ciliatus (fringed brome)	3	0-3	3
Bromus inermis (awnless brome)	25	0-98	34
Bromus japonicus (Japanese chess)	15	0-20	7
Carex lanuginosa (woolly sedge)	13	0-20	10
Carex praegracilis (graceful sedge)	1	0-1	3
Carex sprengelii (Sprengel's sedge)	20	0-20	3
Carex spp. (sedge)	1	0-1	3
Elymus canadensis (Canada wild rye)	1	0-1	3
Elymus piperi (giant wild rye)	1	0-1	3
Hordeum jubatum (foxtail barley)	10	0-10	3
Juncus balticus (wire rush)	10	0-10	3
Koeleria macrantha (June grass)	1	0-1	3
Muhlenbergia richardsonis (mat muhly)	3	0-3	3
Phalaris arundinacea (reed canary grass)	1	0-1	3
Phleum pratense (timothy)	2	0-3	14
Poa compressa (Canada bluegrass)	40	0-40	3
Poa palustris (fowl bluegrass)	3	0-3	7
Poa pratensis (Kentucky bluegrass)	21	0-60	59
Stipa spp. (needle grass)	3	0-3	3
Stipa viridula (green needle grass)	9	0-20	10
Trisetum canescens (tall trisetum)	1	0-1	3
Forbs			
Achillea millefolium (common yarrow)	4	0-20	31
Ambrosia trifida (great ragweed)	3	0-3	3
Anemone cylindrica (long-fruited anemone)	1	0-1	3
Artemisia frigida (pasture sagewort)	1	0-1	10
Artemisia ludoviciana (prairie sagewort)	4	0-20	24
Aster ericoides (tufted white prairie aster)	2	0-3	7
Aster hesperius (western willow aster)	2	0-3	7
Astragalus flexuosus (slender milk vetch)	1	0-1	3
Campanula rotundifolia (harebell)	1	0-1	7
Chenopodium fremontii (Fremont's goosefoot)	2	0-3	7
Chenopodium leptophyllum (narrow-leaved goosefoot)	3	0-3	3
Cirsium arvense (Canada thistle)	8	0-20	28
Echinocystis lobata (wild cucumber)	1	0-1	3
Fragaria virginiana (wild strawberry)	5	0-10	7
Galium boreale (northern bedstraw)	2	0-3	10
Geranium viscosissimum (sticky purple geranium)	3	0-3	3
Geum aleppicum (yellow avens)	2	0-3	7
Geum triflorum (three-flowered avens)	10	0-10	3
Glycyrrhiza lepidota (wild licorice)	6	0-20	21

TABLE 48.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Helianthus nuttallii (common tall sunflower)	3	0-3	3
Heracleum lanatum (cow parsnip)	1	0-1	3
Lactuca pulchella (common blue lettuce)	1	0-1	3
Melilotus alba (white sweet-clover)	20	0-20	3
Melilotus officinalis (yellow sweet-clover)	1	0-1	3
Mentha arvensis (wild mint)	1	0-1	3
Monarda fistulosa (wild bergamot)	3	0-3	3
Opuntia polyacantha (prickly-pear)	1	0-1	3
Oxytropis splendens (showy locoweed)	1	0-1	3
Perideridia gairdneri (squawroot)	1	0-1	3
Polygonum amphibium (water smartweed)	1	0-1	3
Polygonum convolvulus (wild buckwheat)	1	0-1	3
Potentilla gracilis (graceful cinquefoil)	5	0-10	10
Rumex crispus (curled dock)	1	0-1	3
Rumex spp. (dock; sorrel)	1	0-1	3
Sisymbrium loeselii (tall hedge mustard)	1	0-1	3
Smilax herbacea (Carrionflower)	1	0-1	3
Smilacina stellata (star-flowered Solomon's-seal)	2	0-3	7
Solidago canadensis (Canada goldenrod)	1	0-3	17
Solidago missouriensis (low goldenrod)	10	0-20	7
Sonchus arvensis (perennial sow-thistle)	1	0-1	3
Sonchus asper (prickly annual sow-thistle)	3	0-3	3
Stachys palustris (marsh hedge-nettle)	10	0-10	3
Taraxacum officinale (common dandelion)	3	0-3	17
Thalictrum dasycarpum (tall meadow rue)	1	0-1	3
Thalictrum venulosum (veiny meadow rue)	1	0-1	3
Thlaspi arvense (stinkweed)	1	0-1	7
Tragopogon dubius (common goat's-beard)	2	0-3	7
Trifolium repens (white clover)	3	0-3	3
Urtica dioica (common nettle)	7	0-20	14
Vicia americana (wild vetch)	1	0-3	10
Viola canadensis (western Canada violet)	5	0-10	7
Ferns and Allies			
Equisetum arvense (common horsetail)	2	0-3	7
Equisetum laevigatum (smooth scouring-rush)	1	0-1	3

SUCCESSIONAL INFORMATION

The successional status of the *Symphoricarpos occidentalis* (buckbrush) community type is confusing. On many sites, this community type represents a mid-seral grazing disclimax successional stage of the *Acer negundo/Prunus virginiana* (Manitoba maple/choke cherry), the *Populus tremuloides/Cornus stolonifera* (aspen/red-osier dogwood) habitat type, the *Salix bebbiana/Cornus stolonifera* (beaked willow/red-osier dogwood) habitat type, the *Salix lutea/Cornus stolonifera* (yellow willow/red-osier dogwood) habitat type, or the *Salix petiolaris/Cornus stolonifera* (basket willow/red-osier dogwood) habitat type. At other locations, it seems to represent a long-lived mid-seral stage not influenced by heavy grazing pressures. Future work may bring more insight into the ecological status of this community type.

Disturbance Stages

Heavy grazing or browsing pressure will open up stands allowing disturbance species such as *Poa pratensis* (Kentucky bluegrass) to increase. Other disturbance-related species such as *Bromus inermis* (awnless brome) or *Achillea millefolium* (common yarrow) may invade.

SOILS

Soils are quite variable including Regosols and Chernozems. The *Symphoricarpos occidentalis* (buckbrush) community type is found on virtually all soil textures except sand. This community type is tolerant of imperfect drainage and short duration flooding, but is intolerant of long inundation and permanently high water tables. Soil reaction ranges between slightly acid to mildly alkaline (pH 6.0 to 8.0) (Wasser 1982).

ADJACENT COMMUNITIES

Adjacent wetter communities may include *Acer negundo/Prunus virginiana* (Manitoba maple/choke cherry), *Fraxinus pennsylvanica/Prunus virginiana* (green ash/choke cherry) or *Populus tremuloides/Cornus stolonifera* (aspen/red-osier dogwood) habitat type, or types dominated by *Salix bebbiana* (beaked willow) or *Salix lutea* (yellow willow), or the cottonwood, *Salix exigua* (sandbar willow), or *Salix amygdaloides* (peach-leaved willow) community types. Adjacent drier communities may be dominated by *Bromus inermis* (awnless brome) or upland communities.

MANAGEMENT INFORMATION

Livestock

Forage production for these dense, monotypic shrub stands is low. As stands open, forage production increases due to the presence of *Agropyron smithii* (western wheat grass), *Bromus inermis* (awnless brome), and *Poa pratensis* (Kentucky bluegrass). The palatability of *Symphoricarpos occidentalis* (buckbrush) ranges from low to fair for cattle and somewhat higher for sheep (Wasser 1982, Johnson and Nichols 1982, Harrison 2000).

Wildlife

The moderate structural diversity of the *Symphoricarpos occidentalis* (buckbrush) community type provides thermal and hiding cover for big game and upland bird species. The palatability of *Symphoricarpos occidentalis* (buckbrush) is rated good for deer and elk (Wasser 1982, Johnson and Nichols 1982).

Fisheries

This community type offers excellent streambank stabilization due to the rhizomatous nature of *Symphoricarpos occidentalis* (buckbrush).

Fire

Symphoricarpos occidentalis (buckbrush) sprouts vigorously from root crown and rhizomes after fire. Stands are usually denser in burned than in adjacent unburned areas. Spring and fall fires induce sprouting, but frequent fires may reduce cover. In aspen parklands in Saskatchewan, buckbrush sprouted 2 weeks after spring fire; by 3 months, the canopy cover was greater on burned sites than on control plots. Annual burning may restrict expansion of *Symphoricarpos occidentalis* (buckbrush) colonies onto native prairie grasslands. Periodic burning could create even-aged, youthful stands of the species, which may be more productive of wildlife forage and provide better cover (USDA IFSL 1995).

Soil Management and Rehabilitation Opportunities

Symphoricarpos occidentalis (buckbrush) is well adapted for revegetation of disturbed sites due to its habit of growing in dense, colonial stands. It does best on moist, well-drained soils that have not been excessively disturbed. Once established, it grows at a moderate rate and spreads rapidly by root sprouts. Nursery grown seedlings, rooted cuttings, or wildlings are preferred for planting. Critical, erodible sites may need complete exclusion from grazing during planting establishment. Animal populations and stocking rates should be balanced with an ample forage supply available on noncritical sites until after establishment is successful (Wasser 1982).

Recreational Uses and Considerations

Recreational opportunities are good to excellent for hunting big game and upland birds. Because the fruits persist into the winter, *Symphoricarpos occidentalis* (buckbrush) is an important food source for upland birds.

OTHER STUDIES

A *Symphoricarpos occidentalis* (buckbrush) community type is described by Hansen and others (1995) for Montana. Similar communities have been described for Minnesota (Pelton 1953) and the northern Great Plains (Hansen and others 1984, Hansen and Hoffman 1988). A *Symphoricarpos occidentalis* (buckbrush) community is described by Lawrence and Romo (1994) on the Matador Research Station in southern Saskatchewan. Michalsky and others (1994) describe several vegetation types with *Symphoricarpos occidentalis* (buckbrush) as a characteristic species on the Grasslands National Park in extreme southern Saskatchewan.

SEDGE TYPES

Carex aquatilis Habitat Type

(Water Sedge Habitat Type)

CAREAQU

Number of Stands Sampled = 24

Number of Stands Sampled in Saskatchewan = 4

LOCATION AND ASSOCIATED LANDFORMS

The *Carex aquatilis* (water sedge) habitat type is a minor type in the Aspen Parkland Ecoregion and an incidental type in the other ecoregions of the Prairie Ecozone of Saskatchewan. It occurs on broad flat benches or valley bottoms immediately adjacent to open water. It may grade into the *Carex atherodes* (awned sedge) habitat type with a slight increase in the water table. Like the *Carex atherodes* (awned sedge) habitat type, sites are often silted-in beaver ponds, old oxbow sloughs, or narrow bands adjacent to small streams.

VEGETATION

The *Carex aquatilis* (water sedge) habitat type is dominated by *Carex aquatilis* (water sedge), but often has other wet site graminoid species associated with it (Table 49).

Table 49. Average canopy cover, range of canopy cover, and constancy for species recorded in 10 late seral to climax stands of the *Carex aquatilis* (water sedge) habitat type

TABLE 49.	**% Can. Cov.**		
Species	**Avg.**	**Rng.**	**Con.**
Graminoids			
Salix pseudomonticola (false mountain willow)	1	0-1	10
Calamagrostis stricta (narrow reed grass)	1	0-1	10
Carex aquatilis (water sedge)	85	50-98	100
Carex atherodes (awned sedge)	20	0-20	10
Carex rostrata (beaked sedge)	16	0-30	40
Deschampsia cespitosa (tufted hair grass)	1	0-1	10
Glyceria grandis (common tall manna grass)	1	0-1	10
Poa palustris (fowl bluegrass)	1	0-1	10
Forbs			
Aster borealis (marsh aster)	1	0-1	10
Caltha palustris (marsh-marigold)	20	0-20	10
Epilobium palustre (marsh willowherb)	10	0-10	10
Galium trifidum (small bedstraw)	1	0-1	10
Pedicularis groenlandica (elephant's-head)	3	0-3	10
Petasites sagittatus (arrow-leaved coltsfoot)	1	0-1	10
Polygonum amphibium (water smartweed)	7	0-10	20
Potentilla palustris (marsh cinquefoil)	3	0-3	10
Rumex crispus (curled dock)	1	0-1	20
Scutellaria galericulata (marsh skullcap)	1	0-1	10
Viola spp. (violet)	1	0-1	10

SUCCESSIONAL INFORMATION

Carex aquatilis (water sedge) functions as a pioneer colonizer of exposed mineral substrates, such as bare silt left when a beaver dam breaks, and as a climax species with the ability to persist in dominating a site. High water tables and a vigorous network of *Carex aquatilis* (water sedge) rhizomes inhibit establishment of most other species. In general, a high water table throughout the growing season restricts access by livestock. However, due to the palatability of *Carex aquatilis* (water sedge), severe grazing pressures can greatly decrease the cover of the species while increasing cover of disturbance-related herbaceous species such as *Juncus balticus* (wire rush), *Poa pratensis* (Kentucky bluegrass), *Mentha arvensis* (wild mint), *Geum macrophyllum* (large-leaved yellow avens), and others (Table 50).

Table 50. Average canopy cover, range of canopy cover, and constancy for species recorded in 14 disturbed and/or early to mid-seral stands of the *Carex aquatilis* (water sedge) habitat type

TABLE 50.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Shrubs			
Betula glandulosa (bog birch)	3	0-3	14
Potentilla fruticosa (shrubby cinquefoil)	3	0-3	7
Salix bebbiana (beaked willow)	3	0-3	7
Salix candida (hoary willow)	2	0-3	14
Salix petiolaris (basket willow)	1	0-1	7
Salix planifolia (flat-leaved willow)	1	0-1	14
Salix serissima (autumn willow)	3	0-3	7
Graminoids			
Agrostis scabra (rough hair grass)	2	0-3	14
Agropyron trachycaulum (slender wheat grass)	1	0-1	7
Calamagrostis canadensis (bluejoint)	3	0-3	14
Calamagrostis inexpansa (northern reed grass)	5	0-10	14
Calamagrostis stricta (narrow reed grass)	19	0-50	21
Carex aquatilis (water sedge)	70	40-98	100
Carex atherodes (awned sedge)	17	0-30	14
Carex diandra (two-stamened sedge)	10	0-10	7
Carex lanuginosa (woolly sedge)	3	0-3	7
Carex lasiocarpa (hairy-fruited sedge)	3	0-3	7
Carex praegracilis (graceful sedge)	1	0-1	7
Carex rostrata (beaked sedge)	7	0-20	29
Carex simulata (sedge)	30	0-30	7
Carex vesicaria (blister sedge)	1	0-1	7
Deschampsia cespitosa (tufted hair grass)	3	0-3	7
Eleocharis palustris (creeping spike-rush)	2	0-3	14
Glyceria borealis (northern manna grass)	1	0-1	7
Glyceria grandis (common tall manna grass)	1	0-1	7
Glyceria striata (fowl manna grass)	1	0-1	7
Unknown Grass	3	0-3	7
Hordeum jubatum (foxtail barley)	1	0-1	14
Juncus balticus (wire rush)	15	0-50	36
Phalaris arundinacea (reed canary grass)	3	0-3	14
Poa palustris (fowl bluegrass)	3	0-3	7
Scirpus acutus (great bulrush)	3	0-3	14
Scirpus paludosus (prairie bulrush)	1	0-1	7
Forbs			
Allium schoenoprasum (wild chives)	1	0-1	7
Aster hesperius (western willow aster)	1	0-1	7
Unknown mustard	1	0-1	7
Cicuta maculata (water-hemlock)	10	0-10	7
Cirsium arvense (Canada thistle)	1	0-3	21
Epilobium ciliatum (northern willowherb)	1	0-1	7
Erigeron philadelphicus (Philadelphia fleabane)	1	0-1	7
Galium trifidum (small bedstraw)	2	0-3	14
Geum aleppicum (yellow avens)	1	0-1	7
Geum macrophyllum (large-leaved yellow avens)	3	0-3	7
Hippuris vulgaris (common mare's-tail)	1	0-1	14
Mentha arvensis (wild mint)	1	0-3	36
Mentha spp. (mint)	3	0-3	7
Menyanthes trifoliata (buck-bean)	3	0-3	7
Petasites sagittatus (arrow-leaved coltsfoot)	3	0-3	7
Polygonum amphibium (water smartweed)	3	0-3	7
Potentilla anserina (silverweed)	1	0-1	7
Potentilla palustris (marsh cinquefoil)	10	0-10	7
Ranunculus cymbalaria (seaside buttercup)	1	0-1	7
Rumex crispus (curled dock)	2	0-3	14
Rumex occidentalis (western dock)	1	0-3	21
Scutellaria galericulata (marsh skullcap)	1	0-3	29
Sium suave (water parsnip)	1	0-1	14
Sonchus asper (prickly annual sow-thistle)	1	0-1	7
Sonchus spp. (sow-thistle)	12	0-20	14
Stachys palustris (marsh hedge-nettle)	1	0-1	7
Stellaria crassifolia (fleshy stitchwort)	3	0-3	7
Taraxacum officinale (common dandelion)	1	0-1	7
Triglochin maritima (seaside arrow-grass)	1	0-1	7
Typha latifolia (common cattail)	1	0-1	14

TABLE 50.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Ferns and Allies			
Equisetum arvense (common horsetail)	1	0-1	7
Equisetum fluviatile (swamp horsetail)	8	0-20	29

SOILS

Soils of the *Carex aquatilis* (water sedge) phase are typically Organic (Fibrisols, Mesisols, and Humisols). Chernozems are less frequently associated with this phase. Texture ranges from clay to sandy loam. Water tables are at or near the surface throughout the year. Water tables are often lower, and can fall below 1 m (39 in) by mid-summer. This type appears less anaerobic than the *Carex atherodes* (awned sedge) habitat type. Soil reaction varies little between slightly acid and neutral (pH 6.0 to 7.0).

ADJACENT COMMUNITIES

Adjacent wetter sites support the *Carex atherodes* (awned sedge) or *Typha latifolia* (common cattail) habitat types. Drier sites support the *Salix bebbiana/Cornus stolonifera* (beaked willow/red-osier dogwood) habitat type, the *Salix petiolaris/Carex atherodes* (basket willow/awned sedge) habitat type, the *Phalaris arundinacea* (reed canary grass) habitat type, the *Juncus balticus* (wire rush) community type, and the *Poa pratensis* (Kentucky bluegrass) community type.

MANAGEMENT INFORMATION

Livestock

Livestock forage value of *Carex aquatilis* (water sedge) varies with season, previous grazing use, and areal extent of the site. On narrow riparian or wetland sites within large pastures, sedge species are heavily utilized, particularly when upland plants become cured, or where animal distribution and stocking rate problems occur. In general, sedges should respond satisfactorily to traditional grazing systems designed for upland species. However, on streamside sites residual cover should be left to protect the soil surface and filter out sediments during fall rains or spring runoff. Removing cattle for at least 30 days for sedge regrowth should provide sufficient residual cover (Myers 1989).

Very wet soils may deter animal use until drying, however, if heavy grazing does occur, there will be a marked decrease in *Carex aquatilis* (water sedge) and an increase in the less palatable *Juncus balticus* (wire rush). *Juncus balticus* (wire rush) is considered palatable early in the growing season when plants are young and tender. As stems mature and toughen, palatability declines (Hermann 1975).

Frisina (1991) states that for a grazing program to succeed, it must meet the basic biological requirements of plants: photosynthesis, food storage, reproduction, and seedling establishment. In order to meet these requirements, long periods of rest are needed. It is during long growing season rest periods that essential biological processes of food production and storage, reproduction, and seedling establishment occur. In some cases, additional periods of rest may be required to improve or maintain a plant community.

Wildlife

Elk may graze stands of *Carex aquatilis* (water sedge), but this species is not usually a major food source. Waterfowl consume the seeds of associated plants in this type.

Beaver perform a vital role in the health and maintenance of riparian ecosystems. Beaver dams assist in controlling the downcutting of channels, bank erosion, and the movement of sediment downstream (Gordon and others 1992). When beaver construct a dam, they raise the water table in the area, which provides water for hydrophytic plants such as willows and sedges. The beaver dam also slows down the water in the channel, which allows suspended sediment to be deposited behind the dam. The combination of sediment deposition and plant reproduction raises the channel bed, creating a wetland environment, which is excellent waterfowl and fish habitat. It has often been the policy of land managers to trap and kill beaver because they can be a nuisance. However, because beaver produce such desirable habitat and provide many beneficial stream functions, their removal needs to be carefully evaluated.

Fisheries

This habitat type is often located adjacent to waterways supporting trout fisheries. The rhizomatous growth habit of *Carex aquatilis* (water sedge) forms a dense sod, effectively stabilizing streambanks. Overhanging sod provides valuable cover and shade for fish.

Fire

The *Carex aquatilis* (water sedge) type is suited to prescribed burning. Exclusion of livestock during the year prior to burning is essential. Residual cover burns well in spring, prior to the growing season. Fire will reduce litter accumulations and temporarily increase productivity. However, species composition in the community will not drastically shift from dominance by *Carex aquatilis* (water sedge) (DeBenedetti and Parsons 1984).

Care should be taken before burning stands along streambanks because of the excellent erosion protection this habitat type provides.

Soil Management and Rehabilitation Opportunities

Mineral soils are highly susceptible to compaction when wet. Organic soils can be broken and churned by animal trampling. Site productivity may be lowered as soil is disturbed to become less favourable for *Carex aquatilis* (water sedge). Off road vehicles cause serious long-term damage in these moist site types on fine textured soils. Care should be taken to maintain existing roads in order to encourage travellers to stay on the road. New trails or roads should be located on adjacent uplands.

Generally, sedges offer better streambank protection than grasses, primarily due to their stronger rhizomatous roots. *Carex aquatilis* (water sedge) tends to form a dense, thick sod highly resistant to erosion. Along the stream, the sod may become undercut and may sag into the water, providing additional protection to streambanks. However, if grazing or trailing impacts are severe, the heavy weight of the sod makes it susceptible to sloughing.

The low stream gradient and well-developed floodplains typically associated with this type allow high rates of streambank damage recovery through the bank building process. This requires residual vegetation cover remaining in the spring to filter sediments. Removing cattle to allow at least 30 days for fall sedge regrowth should provide sufficient residual cover (Myers 1989).

Recreational Uses and Considerations

Recreational use is usually limited to the associated fishery. Heavy human use in the spring and summer can result in compacted soils, bank damage, and bare soils along stream edges. Moderate amounts of late season use have little impact.

OTHER STUDIES

The *Carex aquatilis* (water sedge) habitat type is described by Hansen and others (1995) for Montana. Mutz and Queiroz (1983), Mattson (1984), Youngblood and others (1985b), and Chadde and others (1988) described similar *Carex aquatilis* (water sedge) communities in eastern Idaho and western Wyoming. In Utah and southeastern Idaho, Padgett and others (1989) described a similar community.

Carex atherodes Habitat Type

(Awned Sedge Habitat Type)

CAREATH
Number of Stands Sampled = 42
Number of Stands Sampled in Saskatchewan = 10

LOCATION AND ASSOCIATED LANDFORMS

The *Carex atherodes* (awned sedge) habitat type is a major, widely distributed type throughout Saskatchewan, but generally less frequently in the extreme south of the province. Sites may be in lentic situations around depressional wetlands, sloughs, potholes, which may be slightly more alkaline than sites supporting *Carex rostrata* (beaked sedge). They may occur in standing water or on sites that become relatively dry during the later part of the growing season. Sites may be located where beaver ponds have filled with sediment. The *Carex atherodes* (awned sedge) habitat type represents one of the wettest riparian and wetland communities.

VEGETATION

The *Carex atherodes* (awned sedge) habitat type in undisturbed condition is typically a monospecific stand of *Carex atherodes* (awned sedge) and/or *Carex rostrata* (beaked sedge) (Table 51).

Table 51. Average canopy cover, range of canopy cover, and constancy for species recorded in 30 late seral to climax stands of the *Carex atherodes* (awned sedge) habitat type

TABLE 51.	**% Can. Cov.**		
Species	**Avg.**	**Rng.**	**Con.**
Shrubs			
Salix planifolia (flat-leaved willow)	1	0-1	3
Graminoids			
Calamagrostis canadensis (bluejoint)	10	0-10	3
Carex aquatilis (water sedge)	10	0-30	10
Carex atherodes (awned sedge)	95	60-98	100
Carex rostrata (beaked sedge)	10	0-40	17
Carex spp. (sedge)	10	0-10	3
Glyceria grandis (common tall manna grass)	1	0-1	3
Hordeum jubatum (foxtail barley)	1	0-1	3
Scirpus pungens (three-square rush)	1	0-1	3
Scolochloa festucacea (spangletop)	3	0-3	3
Forbs			
Caltha palustris (marsh-marigold)	3	0-3	3
Cicuta maculata (water-hemlock)	2	0-3	7
Circaea alpina (small enchanter's nightshade)	1	0-1	3
Galium trifidum (small bedstraw)	3	0-3	3
Geum aleppicum (yellow avens)	1	0-1	3
Lysimachia ciliata (fringed loosestrife)	3	0-3	3
Mentha arvensis (wild mint)	1	0-1	7
Petasites sagittatus (arrow-leaved coltsfoot)	1	0-1	3
Polygonum amphibium (water smartweed)	2	0-3	13
Polygonum arenastrum (common knotweed)	1	0-1	3
Polygonum coccineum (water smartweed)	2	0-3	10
Polygonum lapathifolium (pale persicaria)	1	0-1	3
Rumex occidentalis (western dock)	1	0-1	3
Sagittaria latifolia (broad-leaved arrowhead)	3	0-3	3
Scutellaria galericulata (marsh skullcap)	2	0-3	7
Sium suave (water parsnip)	1	0-1	7
Sonchus arvensis (perennial sow-thistle)	1	0-1	3
Urtica dioica (common nettle)	1	0-1	7
Ferns and Allies			
Equisetum fluviatile (swamp horsetail)	1	0-1	3

SUCCESSIONAL INFORMATION

Carex atherodes (awned sedge) functions as a pioneer colonizer of exposed mineral substrates, such as when a beaver dam breaks, and as a climax species. High water tables and a vigorous rhizomatous root network limit establishment of most other species. In general, a high water table throughout the growing season inhibits access by livestock. However, severe grazing pressures can greatly decrease *Carex atherodes* (awned sedge) cover, while increasing the cover of disturbance-related herbaceous species such as *Mentha arvensis* (wild mint), *Juncus balticus* (wire rush), *Scirpus microcarpus* (small-fruited bulrush), and *Poa palustris* (fowl bluegrass). Severe disturbance may lower the water table and shift the site to domination by *Juncus balticus* (wire rush) or one of the *Poa* species (bluegrass) (Table 52).

Table 52. Average canopy cover, range of canopy cover, and constancy for species recorded in 12 early to mid seral or disturbed stands of the *Carex atherodes* (awned sedge) habitat type

TABLE 52.	**% Can. Cov.**		
Species	**Avg.**	**Rng.**	**Con.**
Shrubs			
Rosa spp. (rose)	1	0-1	8
Salix bebbiana (beaked willow)	1	0-1	8
Graminoids			
Agropyron repens (quack grass)	1	0-1	8
Alopecurus aequalis (short-awned foxtail)	1	0-1	8
Beckmannia syzigachne (slough grass)	1	0-1	8
Carex aquatilis (water sedge)	5	0-10	17
Carex atherodes (awned sedge)	73	30-98	100
Carex rostrata (beaked sedge)	8	0-10	25
Eleocharis acicularis (needle spike-rush)	3	0-3	8
Eleocharis palustris (creeping spike-rush)	10	0-10	8
Glyceria grandis (common tall manna grass)	1	0-1	8
Glyceria striata (fowl manna grass)	3	0-3	8
Juncus balticus (wire rush)	2	0-3	17
Phalaris arundinacea (reed canary grass)	1	0-1	17
Poa palustris (fowl bluegrass)	30	0-90	33
Scirpus acutus (great bulrush)	1	0-1	8
Scirpus microcarpus (small-fruited bulrush)	14	0-20	25
Scolochloa festucacea (spangletop)	20	0-40	17
Forbs			
Cicuta maculata (water-hemlock)	1	0-1	8
Cirsium arvense (Canada thistle)	1	0-1	8
Epilobium ciliatum (northern willowherb)	20	0-20	8
Erigeron philadelphicus (Philadelphia fleabane)	1	0-1	8
Galium trifidum (small bedstraw)	1	0-1	17
Mentha arvensis (wild mint)	3	0-3	25
Petasites sagittatus (arrow-leaved coltsfoot)	1	0-1	17
Polygonum amphibium (water smartweed)	15	0-20	17
Polygonum hydropiper (marshpepper smartweed)	10	0-10	8
Potentilla anserina (silverweed)	3	0-3	8
Potentilla gracilis (graceful cinquefoil)	10	0-10	8
Potentilla palustris (marsh cinquefoil)	1	0-1	8
Rumex crispus (curled dock)	1	0-1	8
Rumex maritimus (golden dock)	3	0-3	8
Rumex occidentalis (western dock)	1	0-1	17
Scutellaria galericulata (marsh skullcap)	10	0-10	17
Sium suave (water parsnip)	10	0-10	8
Sonchus spp. (sow-thistle)	1	0-1	8
Stachys palustris (marsh hedge-nettle)	3	0-3	17
Taraxacum officinale (common dandelion)	3	0-3	8
Thlaspi arvense (stinkweed)	3	0-3	8
Typha latifolia (common cattail)	1	0-1	8
Ferns and Allies			
Equisetum fluviatile (swamp horsetail)	10	0-20	17

SOILS

A wide range of soils is associated with this type. Organic soils (Fibrisols, Mesisols, and Humisols) are most common and often have organic accumulations greater than 1 m (39 in) thick (Brichta 1987). Chernozems and Regosols are also associated with this type. Texture ranges from loamy clay to sandy loam. Redoximorphic features (mottling or gleying) are common in subsurface horizons. Water tables are typically at or above the soil surface throughout the growing season. Available water is estimated at moderate to high.

ADJACENT COMMUNITIES

On many sites the *Carex atherodes* (awned sedge) habitat type is the wettest community present. On other sites *Scirpus acutus* (great bulrush) or *Typha latifolia* (common cattail) stands may be present on adjacent areas with even wetter hydric regimes. Adjacent drier communities man include *Carex aquatilis* (water sedge), *Sailx petiolaris* (basket willow), *Salix bebbiana* (beaked willow), *Juncus balticus* (wire rush), or *Poa palustris* (fowl bluegrass).

MANAGEMENT INFORMATION

Management of the *Carex rostrata* (beaked sedge) and *Carex atherodes* (awned sedge) habitat types are treated similarly.

Livestock

Livestock forage value of *Carex atherodes* (awned sedge) depends on season, previous grazing use, and areal extent of the site. On narrow riparian or wetland sites within large pastures, sedge species are heavily utilized, particularly when upland plants become cured, or where animal distribution and stocking rate problems occur.

In general, sedges should respond satisfactorily to traditional grazing systems designed for upland species. However, on streamside sites residual cover should be left to protect the soil surface and filter out sediments during fall rains or spring runoff. Removing cattle for at least 30 days for sedge regrowth should provide sufficient residual cover (Myers 1989).

Very wet soils may deter animal use until drying, allowing the most palatable species to replenish their carbohydrate reserves and to persist within these communities. However, if heavy grazing does occur, there will be a marked decrease in such highly palatable species as *Deschampsia cespitosa* (tufted hair grass) and an increase in the less palatable *Juncus balticus* (wire rush). *Juncus balticus* (wire rush) is considered palatable early in the growing season when plants are young and tender; however, as stems mature and toughen, palatability declines (Hermann 1975).

Frisina (1991) states that for a grazing program to succeed, it must meet the basic biological requirements of plants: photosynthesis, food storage, reproduction, and seedling establishment. In order to meet these requirements, long periods of rest are needed. It is during long growing season rest periods that essential biological processes of food production and storage, reproduction, and seedling establishment occur. In some cases, additional periods of rest may be required to improve or maintain a plant community.

Wildlife

Wildlife utilization of the *Carex atherodes* (awned sedge) habitat type is not well known at this time, although ecologic conditions are similar to those of the *Carex rostrata* (beaked sedge) habitat type.

Beaver perform a vital role in the health and maintenance of riparian ecosystems. Beaver dams assist in controlling the downcutting of channels, bank erosion, and the movement of sediment downstream (Gordon and others 1992). When beaver construct a dam, they raise the water table in the area, which provides water for hydrophytic plants such as willows and sedges. The beaver dam also slows down the water in the channel, which allows suspended sediment to be deposited behind the dam. The combination of sediment deposition and plant reproduction raises the channel bed, creating a wetland environment, which is excellent waterfowl and fish habitat. It has often been the policy of land managers to trap and kill beaver because they can be a nuisance. However, because beaver produce such desirable habitat and provide many beneficial stream functions, their removal needs to be carefully evaluated.

Fisheries

This type is found more frequently in lentic situations around depressional wetlands, sloughs, potholes, and sites generally more alkaline where fish habitat is not an issue.

Fire

More information on burning the *Carex atherodes* (awned sedge) habitat type will be supplied in a later draft. Residual cover should burn well in early spring, prior to the growing season, or in the fall. Fire will reduce litter accumulations and temporarily increase productivity. Care should be taken before burning because of the excellent soil erosion protection this type provides. In extreme drought conditions, there is danger of burning the peat layer of the soil and damaging the *Carex atherodes* (awned sedge) roots.

Soil Management and Rehabilitation Opportunities

Mineral soils are highly susceptible to compaction when wet. Organic soils can be broken and churned by animal trampling. Site productivity may be lowered as soil is disturbed to become less favourable for *Carex atherodes* (awned sedge). Off road vehicles cause serious long-term damage in these moist site types on fine textured soils. Care should be taken to maintain existing roads in order to encourage travellers to stay on the road. New trails or roads should be located on adjacent uplands.

Generally, sedges offer better streambank protection than grasses, primarily due to their stronger rhizomatous roots. *Carex atherodes* (awned sedge) tends to form a dense, thick sod highly resistant to erosion. Along the stream, the sod may become undercut and may sag into the water, providing additional protection to streambanks. However, if grazing or trailing impacts are severe, the heavy weight of the sod makes it susceptible to sloughing.

The low stream gradient and well-developed floodplains typically associated with this type allow high rates of streambank damage recovery through the bank building process. This requires residual vegetation cover remaining in the spring to filter sediments. Removing cattle to allow at least 30 days for fall sedge regrowth should provide sufficient residual cover (Myers 1989).

Recreational Uses and Considerations

Recreational use is usually limited to the associated fishery. Heavy human use in the spring and summer can result in compacted soils, bank damage, and bare soils along stream edges. Moderate amounts of late season use have little impact.

OTHER STUDIES

The *Carex atherodes* (awned sedge) habitat type has not been described by others. It is similar to the *Carex rostrata* (beaked sedge) habitat type described by Hansen and others (1995) in Montana.

Carex lanuginosa Habitat Type
(Woolly Sedge Habitat Type)

CARELAN
Number of Stands Sampled = 14
Number of Stands Sampled in Saskatchewan = 1

LOCATION AND ASSOCIATED LANDFORMS

The *Carex lanuginosa* (woolly sedge) habitat type is an incidental type on the glaciated prairie of Saskatchewan, primarily in the drier southwest area south of the Cypress Upland. This type is generally associated with meadows, basins, glacial depressions (sloughs), and along lake margins that are anaerobically favourable to the buildup of deep organic soils.

VEGETATION

This type is dominated by *Carex lanuginosa* (woolly sedge). Also frequently present are *Calamagrostis* species (reed grass), *Juncus balticus* (wire rush), and *Agrostis stolonifera* (redtop) (Table 53).

Table 53. Average canopy cover, range of canopy cover, and constancy for species recorded in 5 late seral to climax stands of the *Carex lanuginosa* (woolly sedge) habitat type

TABLE 53.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Graminoids			
Calamagrostis stricta (narrow reed grass)	1	0-1	20
Carex lanuginosa (woolly sedge)	65	10-98	100
Carex lasiocarpa (hairy-fruited sedge)	20	0-20	20
Eleocharis palustris (creeping spike-rush)	30	0-30	20
Eriophorum polystachion (tall cotton grass)	10	0-10	20
Hierochloe odorata (sweet grass)	3	0-3	20
Hordeum jubatum (foxtail barley)	1	0-1	20
Scirpus pungens (three-square rush)	7	0-10	40
Forbs			
Lycopus asper (western water-horehound)	1	0-1	40
Typha latifolia (common cattail)	1	0-1	20

SUCCESSIONAL INFORMATION

Moderate disturbance will increase cover of *Juncus balticus* (wire rush) and associated forbs. Severe disturbance may lower the water table and shift the site to domination by *Juncus balticus* (wire rush) or *Agrostis stolonifera* (redtop) (Table 54).

Due to the rhizomatous habit of *Carex lanuginosa* (woolly sedge), moderately disturbed sites can improve rapidly if protected.

Table 54. Average canopy cover, range of canopy cover, and constancy for species recorded in 9 early to mid seral or disturbed stands of the *Carex lanuginosa* (woolly sedge) habitat type

TABLE 54.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Shrubs			
Potentilla fruticosa (shrubby cinquefoil)	1	0-1	11
Rosa acicularis (prickly rose)	3	0-3	11
Rosa spp. (rose)	1	0-1	11
Salix bebbiana (beaked willow)	1	0-1	11
Graminoids			
Agropyron repens (quack grass)	10	0-10	11
Agrostis stolonifera (redtop)	13	0-40	44
Calamagrostis canadensis (bluejoint)	40	0-40	11
Calamagrostis stricta (narrow reed grass)	19	0-50	33
Carex atherodes (awned sedge)	3	0-3	11
Carex bebbii (Bebb's sedge)	10	0-10	11
Carex flava (yellow sedge)	3	0-3	11
Carex lanuginosa (woolly sedge)	51	10-98	100
Carex lasiocarpa (hairy-fruited sedge)	3	0-3	11
Carex praegracilis (graceful sedge)	3	0-3	11
Carex rostrata (beaked sedge)	20	0-20	11
Carex viridula (green sedge)	1	0-1	11
Deschampsia cespitosa (tufted hair grass)	10	0-10	11
Hordeum jubatum (foxtail barley)	2	0-3	22
Juncus balticus (wire rush)	53	0-80	33
Phalaris arundinacea (reed canary grass)	11	0-30	33
Phleum pratense (timothy)	10	0-10	11
Poa palustris (fowl bluegrass)	20	0-40	22
Poa pratensis (Kentucky bluegrass)	12	0-20	22
Scirpus pallidus (pale bulrush)	1	0-1	11
Scirpus pungens (three-square rush)	40	0-40	11
Forbs			
Allium schoenoprasum (wild chives)	1	0-1	11
Aster ascendens (western aster)	30	0-30	11
Cicuta maculata (water-hemlock)	18	0-40	33
Cirsium arvense (Canada thistle)	3	0-3	22
Cirsium vulgare (bull thistle)	3	0-3	11
Dodecatheon spp. (shooting star)	1	0-1	11
Galium boreale (northern bedstraw)	1	0-1	11

TABLE 54.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Gentiana affinis (prairie gentian)	1	0-1	11
Heracleum lanatum (cow parsnip)	3	0-3	11
Mentha arvensis (wild mint)	5	0-10	33
Polygonum amphibium (water smartweed)	10	0-10	11
Potentilla anserina (silverweed)	20	0-40	22
Potentilla gracilis (graceful cinquefoil)	3	0-3	11
Potentilla palustris (marsh cinquefoil)	30	0-30	11
Ranunculus macounii (Macoun's buttercup)	1	0-1	11
Rumex crispus (curled dock)	1	0-1	11
Scutellaria galericulata (marsh skullcap)	1	0-1	11
Stachys palustris (marsh hedge-nettle)	3	0-3	11
Taraxacum officinale (common dandelion)	3	0-3	11
Ferns and Allies			
Equisetum arvense (common horsetail)	20	0-40	22

SOILS

Soils are typically Organic (Fibrisols, Mesisols, and Humisols), with thick accumulations of partially decomposed sedges. Texture is predominantly loam. Drainage is poor to very poor. Sites are often flooded into July or August, with water tables remaining within the root zone throughout the growing season.

ADJACENT COMMUNITIES

Adjacent wetter communities may be dominated by the *Carex atherodes* (awned sedge) or the *Carex aquatilis* (water sedge) habitat types. Drier communities may be dominated by the *Deschampsia cespitosa* (tufted hair grass) habitat type or the *Juncus balticus* (wire rush) community type.

MANAGEMENT INFORMATION

Livestock

Estimated herbage production is moderate to high ranging from 1,000 to 3,000 lbs/acre dry weight (Kovalchik 1987). *Carex lanuginosa* (woolly sedge) is highly palatable to livestock and may attract earlier use than desired. Livestock tend to avoid the wet meadows or basins until they are surface dry, usually by mid summer. *Carex lanuginosa* (woolly sedge) can rapidly reoccupy moderately disturbed sites under a combination of rest and late season grazing. Livestock should be removed before 40 percent of the summer/fall forage has been utilized to insure an upward trend in ecological status (Kovalchik 1987).

Frisina (1991) states that for a grazing program to succeed, it must meet the basic biological requirements of plants: photosynthesis, food storage, reproduction, and seedling establishment. In order to meet these requirements, long periods of rest are needed. It is during long growing season rest periods that essential biological processes of food production and storage, reproduction, and seedling establishment occur. In some cases, additional periods of rest may be required to improve or maintain a plant community.

Wildlife

The *Carex lanuginosa* (woolly sedge) habitat type is generally flooded long enough to provide nesting habitat for waterfowl. However, is has limited use by songbirds and small mammals due to the lack of diversity and flooded soils. It is an important habitat for raptors, deer, and elk. Deer use the type for fawning.

Beaver perform a vital role in the health and maintenance of riparian ecosystems. Beaver dams assist in controlling the downcutting of channels, bank erosion, and the movement of sediment downstream (Gordon and others 1992). When beaver construct a dam, they raise the water table in the area, which provides water for hydrophytic plants such as willows and sedges. The beaver dam also slows down the water in the channel, which allows suspended sediment to be deposited behind the dam. The combination of sediment deposition and plant reproduction raises the channel bed, creating a wetland environment that is excellent waterfowl and fish habitat. It has often been the policy of land managers to trap and kill beaver because they can be a nuisance. However, because beaver produce such desirable habitat and provide many beneficial stream functions, their removal needs to be carefully evaluated.

Fire

Fire will help reduce litter accumulations and competitors. Dominant sedges of this habitat type are resistant to damage by fire except where hot fires penetrate the peat soil.

Soil Management and Rehabilitation Opportunities

Mechanical activities in this habitat type should be avoided because of the fragile nature of wet, organic soils. Livestock should be kept off these sites until surface soils are dry. Trails and roads should be located on the adjacent uplands.

Carex lanuginosa (woolly sedge) is useful for improving degraded sites. Its long, creeping rhizomes form a dense mat, effectively stabilizing streambank soils.

Recreational Uses and Considerations

The sites provide good opportunities for viewing deer, elk, and waterfowl. Floodplain sites adjacent to streams are often used for fishing access.

OTHER STUDIES

The *Carex lanuginosa* (woolly sedge) habitat type is described by Hansen and others (1995) in Montana. This type is similar to the *Carex lanuginosa* (woolly sedge) and the *Carex lasiocarpa* (hairy-fruited sedge) associations described by Kovalchik (1987) for central. Padgett and others (1989) described a similar community for Utah and southeastern Idaho.

NON-SEDGE TYPES

Agropyron smithii Habitat Type
(Western Wheat Grass Habitat Type)

AGROSMI
Number of Stands Sampled = 34
Number of Stands Sampled in Saskatchewan = 9

CAUTION—Not all sites currently dominated by *Agropyron smithii* (western wheat grass) are considered riparian or wetland sites. In some instances, they are considered upland sites. The topographic position of the site must match the description as presented in the Location and Associated Landform section.

LOCATION AND ASSOCIATED LANDFORMS

The *Agropyron smithii* (western wheat grass) habitat type is a minor type in the Mixed Grassland Ecoregion and an incidental type in the Moist Mixed Grassland Ecoregion in southwestern Saskatchewan. This type may occupy the lowest level of a slight depression or a relatively flat alluvial fan position. Sites may be swales and nearly level alluvial terraces where either overland flow or soil conditions (fine textures), or a combination of both, provide more available moisture than surrounding uplands. In many situations, the fine textured soils have resulted in a perched water table.

VEGETATION

In the *Agropyron smithii* (western wheat grass) habitat type, *Agropyron smithii* (western wheat grass) typically occurs in nearly pure stands with limited presence of other species (Table 55).

Table 55. Average canopy cover, range of canopy cover, and constancy for species recorded in 14 late seral to climax stands of the *Agropyron smithii* (western wheat grass) habitat type

TABLE 55.	**% Can. Cov.**		
Species	**Avg.**	**Rng.**	**Con.**
Shrubs			
Artemisia cana (silver sagebrush)	1	0-1	7
Graminoids			
Agropyron smithii (western wheat grass)	89	80-98	100
Bouteloua curtipendula (sideoat grama)	1	0-1	7
Bromus inermis (awnless brome)	2	0-3	14
Bromus japonicus (Japanese chess)	1	0-1	7
Carex spp. (sedge)	1	0-1	7
Deschampsia cespitosa (tufted hair grass)	1	0-1	7
Hordeum jubatum (foxtail barley)	1	0-3	29
Poa palustris (fowl bluegrass)	1	0-1	7
Poa pratensis (Kentucky bluegrass)	3	0-3	7
Stipa comata (needle-and-thread)	1	0-1	7
Stipa viridula (green needle grass)	11	0-20	21
Forbs			
Achillea millefolium (common yarrow)	1	0-1	7
Artemisia frigida (pasture sagewort)	5	0-10	14
Artemisia ludoviciana (prairie sagewort)	1	0-1	7
Aster ascendens (western aster)	3	0-3	7
Atriplex spp. (atriplex)	1	0-1	7
Atriplex prostrata (prostrate saltbush)	1	0-1	7
Eurotia lanata (winter-fat)	3	0-3	7
Grindelia squarrosa (gumweed)	1	0-1	14
Kochia scoparia (summer-cypress)	3	0-3	7
Lactuca pulchella (common blue lettuce)	1	0-1	7
Linum lewisii (wild blue flax)	1	0-1	7
Melilotus officinalis (yellow sweet-clover)	2	0-3	14
Polygonum spp. (Knotweed; Smartweed; Bistort)	3	0-3	7
Rumex crispus (curled dock)	2	0-3	14

TABLE 55.	**% Can. Cov.**		
Species	**Avg.**	**Rng.**	**Con.**
Rumex triangulivalvis (narrow-leaved dock)	1	0-1	7
Sonchus arvensis (perennial sow-thistle)	1	0-1	7
Sonchus asper (prickly annual sow-thistle)	1	0-1	14
Sphaeralcea coccinea (scarlet mallow)	3	0-3	7
Taraxacum officinale (common dandelion)	3	0-3	7
Tragopogon dubius (common goat's-beard)	1	0-1	7
Vicia americana (wild vetch)	2	0-3	21

SUCCESSIONAL INFORMATION

Overgrazing of these sites will reduce the vigour and cover of *Agropyron smithii* (western wheat grass). Severe overgrazing will convert the site to domination by less desirable species such as *Poa* species (bluegrass), *Artemisia ludoviciana* (prairie sagewort), *Artemisia frigida* (pasture sagewort), and *Xanthium strumarium* (cocklebur). Where grazing pressure is removed, sites may be invaded by *Symphoricarpos occidentalis* (buckbrush), and *Rosa woodsii* (common wild rose) (Table 56).

Table 56. Average canopy cover, range of canopy cover, and constancy for species recorded in 20 disturbed and/or early to mid-seral stands of the *Agropyron smithii* (western wheat grass) habitat type

TABLE 56.	**% Can. Cov.**		
Species	**Avg.**	**Rng.**	**Con.**
Shrubs			
Artemisia cana (silver sagebrush)	1	0-3	40
Clematis spp. (clematis)	3	0-3	5
Juniperus scopulorum (Rocky Mountain juniper)	1	0-1	5
Rosa woodsii (common wild rose)	1	0-3	20
Rosa spp. (rose)	1	0-1	5
Symphoricarpos occidentalis (buckbrush)	1	0-3	30
Graminoids			
Agropyron pectiniforme (crested wheat grass)	1	0-1	5
Agropyron repens (quack grass)	5	0-10	10
Agropyron smithii (western wheat grass)	70	40-98	100
Agrostis stolonifera (redtop)	1	0-1	5
Agropyron trachycaulum (slender wheat grass)	1	0-1	5
Bouteloua gracilis (blue grama)	3	0-3	5
Bromus inermis (awnless brome)	1	0-3	15
Bromus japonicus (Japanese chess)	1	0-1	10
Calamovilfa longifolia (sand grass)	1	0-1	5
Carex filifolia (thread-leaved sedge)	3	0-3	5
Carex spp. (sedge)	3	0-3	5
Distichlis stricta (salt grass)	16	0-50	20
Echinochloa crusgalli (barnyard grass)	1	0-1	5
Elymus canadensis (Canada wild rye)	1	0-1	5
Hordeum jubatum (foxtail barley)	7	0-10	25
Koeleria macrantha (June grass)	10	0-10	5
Poa bulbosa (Bulbous Bluegrass)	3	0-3	5
Poa compressa (Canada bluegrass)	1	0-1	5
Poa interior (inland bluegrass)	1	0-1	5
Poa juncifolia (alkali bluegrass)	3	0-3	5
Poa palustris (fowl bluegrass)	2	0-3	10
Poa pratensis (Kentucky bluegrass)	17	0-40	25
Poa spp. (bluegrass)	20	0-20	5
Puccinellia nuttalliana (Nuttall's salt-meadow grass)	20	0-20	5
Scirpus paludosus (prairie bulrush)	1	0-1	5
Scirpus pungens (three-square rush)	3	0-3	5
Setaria viridis (green foxtail)	1	0-1	5
Spartina pectinata (prairie cord grass)	3	0-3	5
Stipa comata (needle-and-thread)	3	0-3	5
Stipa viridula (green needle grass)	3	0-3	25
Forbs			
Achillea millefolium (common yarrow)	7	0-20	25
Agastache foeniculum (giant hyssop)	1	0-1	5
Allium textile (prairie onion)	3	0-3	5

TABLE 56.	% Can. Cov.		
Species	Avg.	Rng.	Con.
Alyssum alyssoides (small alyssum)	10	0-10	5
Antennaria parvifolia (small-leaved everlasting)	1	0-1	5
Arnica fulgens (shining arnica)	20	0-20	5
Artemisia absinthium (absinthe wormwood)	1	0-1	5
Artemisia dracunculus (dragonwort)	3	0-3	5
Artemisia frigida (pasture sagewort)	1	0-3	15
Artemisia ludoviciana (prairie sagewort)	5	0-20	25
Aster brachyactis (rayless aster)	20	0-20	5
Aster ericoides (tufted white prairie aster)	12	0-20	10
Aster laevis (smooth aster)	10	0-10	5
Bidens cernua (nodding beggarticks)	10	0-10	5
Cardaria draba (heart-podded hoary cress)	3	0-3	5
Cerastium arvense (field mouse-ear chickweed)	1	0-1	5
Chenopodium album (lamb's-quarters)	2	0-3	10
Chenopodium fremontii (Fremont's goosefoot)	2	0-3	10
Chenopodium leptophyllum (narrow-leaved goosefoot)	3	0-3	5
Cirsium arvense (Canada thistle)	1	0-1	5
Conyza canadensis (Horseweed)	12	0-20	10
Coryphantha vivipara (cushion cactus)	1	0-1	5
Descurainia sophia (flixweed)	1	0-1	5
Euphorbia esula (leafy spurge)	1	0-3	15
Eurotia lanata (winter-fat)	3	0-3	5
Unknown Forb	1	0-1	15
Galium aparine (cleavers)	1	0-1	5
Gaura coccinea (scarlet butterflyweed)	1	0-1	5
Geum triflorum (three-flowered avens)	3	0-3	5
Glycyrrhiza lepidota (wild licorice)	10	0-40	30
Grindelia squarrosa (gumweed)	1	0-1	5
Gutierrezia sarothrae (broomweed)	1	0-1	5
Habenaria hyperborea (northern green bog orchid)	1	0-1	5
Helianthus couplandii (Coupland's annual sunflower)	1	0-1	5
Lactuca pulchella (common blue lettuce)	2	0-3	10

TABLE 56.	% Can. Cov.		
Species	Avg.	Rng.	Con.
Liatris punctata (dotted blazingstar)	3	0-3	5
Lupinus lepidus (alpine lupine)	1	0-1	5
Lysimachia ciliata (fringed loosestrife)	1	0-1	5
Medicago lupulina (black medick)	10	0-10	5
Medicago sativa (alfalfa)	1	0-1	5
Melilotus alba (white sweet-clover)	3	0-3	5
Melilotus officinalis (yellow sweet-clover)	3	0-3	15
Opuntia polyacantha (prickly-pear)	1	0-1	10
Parietaria pensylvanica (American pellitory)	20	0-20	5
Penstemon procerus (slender blue beardtongue)	1	0-1	5
Plantago major (common plantain)	3	0-3	5
Plantago patagonica (Pursh's plantain)	3	0-3	5
Polygonum convolvulus (wild buckwheat)	1	0-1	5
Potentilla anserina (silverweed)	3	0-3	5
Potentilla gracilis (graceful cinquefoil)	1	0-1	5
Psoralea argophylla (silverleaf psoralea)	3	0-3	5
Rumex crispus (curled dock)	2	0-3	10
Rumex spp. (dock; sorrel)	1	0-1	5
Sisymbrium loeselii (tall hedge mustard)	3	0-3	5
Solidago missouriensis (low goldenrod)	3	0-3	5
Sonchus arvensis (perennial sow-thistle)	6	0-10	20
Sphaeralcea coccinea (scarlet mallow)	1	0-1	5
Taraxacum officinale (common dandelion)	1	0-1	15
Thlaspi arvense (stinkweed)	3	0-3	5
Tragopogon dubius (common goat's-beard)	1	0-1	20
Triglochin maritima (seaside arrow-grass)	3	0-3	5
Vicia americana (wild vetch)	2	0-3	10
Xanthium strumarium (cocklebur)	5	0-20	20

SOILS

Soil texture ranges from clay to silt loam. Drainage ranges from poor to very poor. Seasonal flooding is common in spring after snowmelt. Soil reaction varies widely from neutral to moderately alkaline (pH 7.0 to 8.5). Saline soils are also common.

ADJACENT COMMUNITIES

This type may occupy the lowest level of a slight depression or a relatively flat alluvial fan position, but adjacent wetter sites may include *Salix* species (willow) types, the *Shepherdia argentea* (thorny buffaloberry) community type, the *Deschampsia cespitosa* (tufted hair grass) habitat type, or the *Hordeum jubatum* (foxtail barley) community type. Adjacent drier sites may support the *Artemisia cana/Agropyron smithii* (silver sagebrush/western wheat grass) or the *Sarcobatus vermiculatus/Agropyron smithii* (greasewood/western wheat grass) habitats, or be dominated by upland species.

MANAGEMENT INFORMATION

Livestock

Forage production of the *Agropyron smithii* (western wheat grass) habitat type is moderate to high. *Agropyron smithii* (western wheat grass) is highly desired by livestock. This species is very palatable and nutritious when green in the spring, and moderately so during other times of the year (Johnson and Nichols 1982). In Montana, it is commonly cut for hay. Vigorous rhizomes make *Agropyron smithii* (western wheat grass) one of the more tolerant of the desirable and abundant grasses to grazing pressure and drought. However, overgrazing in May and June will decrease its abundance. When growing conditions improve following drought or overgrazing, it may rapidly recolonize areas previously occupied.

Wildlife

Hiding and thermal cover is minimal in this type. However, it may be used for nesting sites by a variety of waterfowl. The *Agropyron smithii* (western wheat grass) habitat type is highly desired by wildlife such as deer and antelope. It is palatable and nutritious when green in the spring, and moderately so during other times of the year (Johnson and Nichols 1982).

Fire

Agropyron smithii (western wheat grass) has a good tolerance to fire in the dormant state. It usually survives fires during the growing season but recovery may be delayed (Wasser 1982). A study investigating the effects of fire on *Agropyron smithii* (western wheat grass) found that vegetative propagation was enhanced immediately after burning, and growth returned to the level of unburned plots during the second growing season (USDA IFSL 1995). Although early spring burning apparently retards growth of new shoots, this effect does not persist, as fall- and spring-burned plants have similar yields after mid-May. However, burns in the spring after new growth is initiated can severely injure this species. Annual spring burns favour the cool-season *Agropyron smithii* (western wheat grass). Although burning any time reduces height of the species, plants increase in abundance and density after a fire. Fall burning also stimulates productivity but to a lesser degree. Forage quality can be improved with burning (USDA IFSL 1995).

Soil Management and Rehabilitation Opportunities

Agropyron smithii (western wheat grass) is potentially valuable for revegetating some disturbed or degraded wetland sites in eastern and central Montana. Using transplants will speed the recovery process, as seedlings are typically slow growing. However, once established, plants quickly spread by rhizomes.

Agropyron smithii (western wheat grass) tolerates moderately severe drought if it is not greatly prolonged, surviving by rhizomes (Wasser 1982).

OTHER STUDIES

The *Agropyron smithii* (western wheat grass) habitat type is described by Hansen and others (1995) in Montana. Similar sites in the northern Great Plains have described by Hansen and others (1984) and Hansen and Hoffman (1988). Michalsky and others (1994) describe several herbaceous vegetation types with *Agropyron smithii* (western wheat grass) as a characteristic species on the Grasslands National Park in extreme southern Saskatchewan.

Bromus inermis Community Type
(Awnless Brome Community Type)

BROMINE
Number of Stands Sampled = 7
Number of Stands Sampled in Saskatchewan = 5

LOCATION AND ASSOCIATED LANDFORMS

The *Bromus inermis* (awnless brome) community type is a minor, widespread type across southern Saskatchewan. Stands are located on mesic alluvial terraces that were previously cultivated hay meadows or subjected to high grazing pressures, and also on sites that have been altered hydrologically by drainage, drought, or otherwise lowered water table.

VEGETATION

Native and introduced elements within this species are present in Saskatchewan. The native *Bromus inermis* ssp *pumpellianus* (northern awnless brome) is difficult to distinguish in the field from the introduced subspecies *Bromus inermis* (awnless brome). The latter is a European meadow grass that is widely introduced and naturalized in North America. We do not attempt to differentiate between the two subspecies in this document.

Due to the aggressive nature of the species, and the high degree of disturbance on many suitable sites, *Bromus inermis* (awnless brome) now dominates many sites in nearly pure stands. If these stands are not too severely grazed, they may be dominated entirely by *Bromus inermis* (awnless brome); otherwise, they may have a mixture of herbaceous "weedy" species including *Poa pratensis* (Kentucky bluegrass), *Agrostis stolonifera* (redtop), or disturbance-related forb species (Table 57). Stands of this type represent one of the drier of the herbaceous riparian or wetland community types.

Table 57. Average canopy cover, range of canopy cover, and constancy for species recorded in 7 sampled stands of the *Bromus inermis* (awnless brome) community type

TABLE 57.	**% Can. Cov.**		
Species	**Avg.**	**Rng.**	**Con.**
Shrubs			
Rosa spp. (rose)	10	0-10	14
Symphoricarpos occidentalis (buckbrush)	10	0-10	14
Graminoids			
Agropyron smithii (western wheat grass)	3	0-3	14
Bromus inermis (awnless brome)	96	90-98	100
Forbs			
Alyssum desertorum (desert alyssum)	1	0-1	14
Cirsium arvense (Canada thistle)	1	0-1	14
Crepis tectorum (annual hawk's-beard)	1	0-1	14
Glycyrrhiza lepidota (wild licorice)	10	0-10	14
Medicago sativa (alfalfa)	3	0-3	14
Melilotus officinalis (yellow sweet-clover)	1	0-1	14
Polygonum amphibium (water smartweed)	10	0-10	14
Rumex crispus (curled dock)	3	0-3	14

TABLE 57.	% Can. Cov.		
Species	Avg.	Rng.	Con.
Sonchus spp. (sow-thistle)	3	0-3	14
Taraxacum officinale (common dandelion)	1	0-1	14

SUCCESSIONAL INFORMATION

The *Bromus inermis* (awnless brome) community type may represent an early/mid-seral grazing disclimax of many types including the *Deschampsia cespitosa* (tufted hair grass) and the *Agropyron smithii* (western wheat grass) habitat types. This type may also establish on sites where potential for native riparian species is lost due to lowered water table. This can occur when beaver and their dams are removed from a stream, from irrigation diversion of water from a stream, or as a result of pumping out ground water. Once a suitable site is disturbed, the extensive rhizome system of *Bromus inermis* (awnless brome) allows it to rapidly spread and establish on these areas. It tolerates high levels of utilization, making replacement by former dominants very difficult. Close observation of sites on similar landscape positions may give insight to the climax community for the site.

SOILS

Soils are typically Brown and Dark Brown Chernozems or Regosols. *Bromus inermis* (awnless brome) thrives on moist, well-drained, finer textured soils. It does poorly on sandy or dense clay soils. *Bromus inermis* (awnless brome) is generally intolerant of prolonged flooding, seasonally high water tables, or poor drainage. It is tolerant of weakly acidic to slightly alkaline soils.

ADJACENT COMMUNITIES

Wetter sites support a wide range of communities including the *Populus tremuloides/Cornus stolonifera* (aspen/red-osier dogwood) habitat type, the *Populus deltoides* (plains cottonwood) and the *Populus balsamifera* (balsam poplar) series of community types, the *Salix bebbiana/ Cornus stolonifera* (beaked willow/red-osier dogwood) habitat type, the *Salix lutea/ Cornus stolonifera* (yellow willow/red-osier dogwood) habitat type, and the *Carex rostrata* (beaked sedge), and *Juncus balticus* (wire rush) types. Adjacent drier sites may be dominated by a wide variety of upland types.

MANAGEMENT INFORMATION

Livestock

The *Bromus inermis* (awnless brome) community type has high forage value. *Bromus inermis* (awnless brome) is highly palatable to livestock when green, but less so when it is cured (USDA Forest Service 1937). The species is a cool season grass. During the summer, it becomes semi-dormant until fall rains, but fall regrowth is seldom great (Paulsen and Smith 1968, Raese and Decker 1966).

Moderate grazing on the *Bromus inermis* (awnless brome) community type in the spring and fall can complement ranges of native warm season species grazed during the summer. A rotation grazing system encourages more uniform grazing use. Periodic rest when *Bromus inermis* (awnless brome) is actively growing helps maintain vigorous stands (Wasser 1982).

Bromus inermis (awnless brome) is a highly competitive, sod-forming grass. It has a dense system of shallow, fibrous roots and rhizomes and an extensive network of deeper roots on well-drained sites. However, high water tables that create saturated conditions within its rooting zone cause a decrease in number of roots and a reduction in overall vigour. Dense monocultures typically become sod-bound 3-5 years after establishment (Wasser 1982).

Grazing practices influence the growth form present. A high density of weak, low vigour tillers results from season-long grazing. Early season rest can increase the vigour of *Bromus inermis* (awnless brome) stands. Fewer shoots may be produced, but total aboveground biomass tends to be greater. Streambanks with *Bromus inermis* (awnless brome) stands are susceptible to hoof shear damage.

Wildlife

Elk and deer use the grasses and forbs of this type, especially in early spring when other forages have not yet greened (Gaffney 1941, Singer 1975). Waterfowl utilize *Bromus inermis* (awnless brome) for food and cover. Canada geese often graze young plants (Martin and others 1951). Upland game birds, small mammals, and small nongame birds also use this type for cover, but species diversity is typically low (Dittberner and Olson 1983).

Fisheries

The *Bromus inermis* (awnless brome) community type is not very effective in stabilizing streambanks. Bank undercutting and sloughing may occur, especially when soils are wet or stands weakened by excessive grazing.

Fire

Early spring (late March-April) or late-season (late summer-fall) fire can increase *Bromus inermis* (awnless brome) productivity, especially if it has become sod-bound. Late spring fire generally damages cool-season grasses such as *Bromus inermis* (awnless brome) (USDA IFSL 1995). This species is able to quickly resprout following burning because of its extensive network of rhizomes. However, it is intolerant of burning during the active growth stages and can be successfully controlled by late spring burning. Cool burns will have little effect on *Bromus inermis* (awnless brome) (Wasser 1982).

Soil Management and Rehabilitation Opportunities

The potential for soil compaction is greatest in the spring when soils are moist. *Bromus inermis* (awnless brome) has an extensive rhizome system, but its shallow rooting characteristics in all but well drained sites make it only marginally effective in stabilizing streambanks. The potential for erosional problems associated with this community type can be quite high. Managers need to pay close attention to streambanks covered by *Bromus inermis* (awnless brome) to detect early signs of streambank collapse. Once the streambank starts to laterally cut, little can be done to save it short of expensive reconstructive treatments.

So often on these degraded sites, water tables have dropped reach of the native riparian species, and these sites will continue to be dominated by introduced grasses. On those sites adjacent to a first or second order streams, the use of rock check dams to aid in the rehabilitation of degraded (de-watered) sites is an excellent cost effective approach. The rock dam will help raise the water table thereby allowing the willows and sedges (under careful grazing management) to reclaim a degraded site.

OTHER STUDIES

The *Bromus inermis* (awnless brome) community type is described by Hansen and others (1995) in Montana.

Calamagrostis stricta Community Type
(Narrow Reed Grass Community Type)

CALASTR

Number of Stands Sampled = 8

Number of Stands Sampled in Saskatchewan = 1

Note: The *Calamagrostis stricta* (narrow reed grass) community type includes all combinations of *Calamagrostis stricta* (narrow reed grass) and *Calamagrostis inexpansa* (northern reed grass).

LOCATION AND ASSOCIATED LANDFORMS

The *Calamagrostis stricta* (narrow reed grass) community type is an incidental type at low to mid elevations in southern Saskatchewan. The type occurs in wet meadows, basins, and slightly saline depressions.

VEGETATION

The diagnostic species of this community type are *Calamagrostis stricta* (narrow reed grass) and *Calamagrostis inexpansa* (northern reed grass). Generally present also are *Juncus balticus* (wire rush) and *Hordeum jubatum* (foxtail barley). Associated herbaceous species may include *Poa palustris* (fowl bluegrass) and *Mentha arvensis* (wild mint) (Table 58).

Table 58. Average canopy cover, range of canopy cover, and constancy for species found in 8 stands of the *Calamagrostis stricta* (narrow reed grass) community type

TABLE 58.	**% Can. Cov.**		
Species	**Avg.**	**Rng.**	**Con.**
Graminoids			
Agropyron smithii (western wheat grass)	10	0-10	13
Beckmannia syzigachne (slough grass)	1	0-1	13
Calamagrostis inexpansa (northern reed grass)	60	0-90	38
Calamagrostis stricta (narrow reed grass)	68	0-98	63
Carex atherodes (awned sedge)	1	0-1	13
Carex lanuginosa (woolly sedge)	20	0-20	13
Deschampsia cespitosa (tufted hair grass)	10	0-10	13
Glyceria grandis (common tall manna grass)	1	0-1	13
Hordeum jubatum (foxtail barley)	6	0-20	75
Juncus balticus (wire rush)	22	0-60	75
Phalaris arundinacea (reed canary grass)	1	0-1	13
Phleum pratense (timothy)	3	0-3	13
Poa palustris (fowl bluegrass)	17	0-30	38
Poa pratensis (Kentucky bluegrass)	10	0-10	13
Puccinellia nuttalliana (Nuttall's salt-meadow grass)	1	0-1	13
Scirpus acutus (great bulrush)	1	0-1	13
Forbs			
Achillea millefolium (common yarrow)	1	0-1	13
Antennaria parvifolia (small-leaved everlasting)	1	0-1	13
Aster borealis (marsh aster)	1	0-1	13
Aster spp. (aster)	3	0-3	13
Aster subspicatus (leafy-bracted aster)	1	0-1	13
Cirsium arvense (Canada thistle)	1	0-3	38
Erigeron philadelphicus (Philadelphia fleabane)	3	0-3	13
Fragaria virginiana (wild strawberry)	1	0-1	25
Geum macrophyllum (large-leaved yellow avens)	3	0-3	13
Melilotus alba (white sweet-clover)	10	0-10	13
Mentha arvensis (wild mint)	8	0-20	38
Polygonum amphibium (water smartweed)	1	0-3	38
Potentilla anserina (silverweed)	7	0-10	25
Potentilla norvegica (rough cinquefoil)	1	0-1	13
Potentilla pensylvanica (prairie cinquefoil)	10	0-10	13
Rumex occidentalis (western dock)	1	0-1	13
Scutellaria galericulata (marsh skullcap)	1	0-1	13
Sonchus arvensis (perennial sow-thistle)	3	0-3	13

TABLE 58.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Sonchus spp. (sow-thistle)	5	0-10	25
Taraxacum officinale (common dandelion)	1	0-1	13
Trifolium repens (white clover)	1	0-1	13
Urtica dioica (common nettle)	20	0-20	13
Veronica scutellata (marsh speedwell)	1	0-1	13
Viola spp. (violet)	10	0-10	13
Ferns and Allies			
Equisetum arvense (common horsetail)	1	0-1	13

SUCCESSIONAL INFORMATION

The successional status of this type is not yet well understood due to the lack of sites found in undisturbed condition. Severely disturbed moist sites generally become dominated by *Juncus balticus* (wire rush) and by an assortment of forbs. These disturbed stands begin to take on the appearance of the *Juncus balticus* (wire rush) or *Hordeum jubatum* (foxtail barley) community types.

SOILS

Soils are commonly Entisols (Aquents and Fluvents) or Inceptisols (Aquepts) (Mattson 1984). Parent materials are usually coarse textured alluvium along low gradient streams. Soil texture is finer (clay loam to sand) on sites adjacent to wet meadows. Plant available water is estimated at moderate to high, and soils remain moist through much of the growing season.

ADJACENT COMMUNITIES

Adjacent wetter communities may be dominated by *Carex rostrata* (beaked sedge), *Carex atherodes* (awned sedge), or *Carex aquatilis* (water sedge) habitat types. Adjacent drier communities may be dominated by *Salix* (willows), *Deschampsia cespitosa* (tufted hair grass), or one of the *Populus balsamifera* (balsam poplar) series of community types.

MANAGEMENT INFORMATION

Livestock

Moderate grazing reduces the reproductive potential and vigour of *Calamagrostis stricta* (narrow reed grass) through reduced seed head production and depletion of carbohydrate reserves. Under heavy grazing cover is reduced and other graminoids and forbs increase on the site. Severely disturbed dry sites become dominated by such graminoids as *Juncus balticus* (wire rush), *Hordeum jubatum* (foxtail barley), or *Poa palustris* (fowl bluegrass); and have an abundance of forbs such as *Mentha arvensis* (wild mint), *Potentilla anserina* (silverweed), and *Sonchus* species (sow-thistle).

Forage production from the *Calamagrostis stricta* (narrow reed grass) community type is moderate to high. Palatability varies from moderate to high, depending upon season and availability of other species (USDA Forest Service 1937). Foliage is most palatable when young, but wet conditions early in the grazing season limits use by livestock. Continued close utilization reduces production on the site.

The *Calamagrostis stricta* (narrow reed grass) community type is generally moist until mid summer and is preferred as mid to late season pasture by livestock following forage depletion on adjacent uplands. Therefore, the season of use often coincides with the maturity of *C. stricta* (narrow reedgrass), and grazing by livestock can limit impact on meadows when done with moderation. However, grazing should be restricted when soils are moist, especially along streams where bank sloughing can occur.

In order to develop an upward trend in ecological status on moderately disturbed sites, time the season of use by livestock to both the drying of the soil surface and to the maturation of the seed heads. Livestock should be removed when 40 percent or less utilization of herbaceous forage is taken. *Juncus balticus* (wire rush) is considered palatable early in the growing season when plants are young and tender. As stems mature and toughen, palatability declines (Hermann 1975). In severely disturbed sites, more intensive rehabilitation strategies will be required due to the abundance of *Poa palustris* (fowl bluegrass), *Juncus balticus* (wire rush), and *Hordeum jubatum* (foxtail barley).

Frisina (1991) states that for a grazing program to be successful, it must meet the basic biological requirements of the plants such as photosynthesis, food storage, reproduction, and seedling establishment. In order to meet these requirements, long periods of rest are needed. It is during long growing season rest periods that the essential biological processes of food production and storage, reproduction, and seedling establishment take place. In some instances, additional periods of rest may be required to either improve or maintain a plant community.

Wildlife

Elk may make moderate summer use of *Calamagrostis* species (reed grass) and *Juncus balticus* (wire rush) (Kufeld 1973).

Fisheries

The rhizomatous nature of *Calamagrostis* species (reed grass) will help provide bank stability for those sites adjacent to streams.

Fire

Fires reducing the abundance of other associated species tend to result in dramatic increases in *Calamagrostis stricta* (narrow reed grass) and other rhizomatous species (Haeussler and Coates 1986). Repeated burning tends to favour rhizomatous species such as *Poa pratensis* (Kentucky bluegrass) and *Agropyron trachycaulum* (slender wheat grass). Burning should be postponed if livestock are present to avoid attracting animals to young, palatable regrowth.

Soil Management and Rehabilitation Opportunities

Coarse textured soils do not have compaction problems. Sites with fine textured soils are susceptible to compaction, particular when moist. In most cases, roads and trails should be located on adjacent uplands. *Calamagrostis stricta* (narrow reed grass) propagates itself by both seeds and rhizomes, making it a valuable species for stabilizing or rehabilitating disturbed sites.

OTHER STUDIES

Beckingham and Archibald (1996) and Beckingham and others (1996) describe rich fen community types dominated by *Calamagrostis* species (reed grass) in the Boreal Mixedwood Ecoregion of Alberta and in the Mid-boreal Ecoregion of Saskatchewan. Hansen and others (1995) describe a *Calamagrostis canadensis* (bluejoint) habitat type in the mountains and foothills of Montana. Both examples of other *Calamagrostis* species (reed grass) types cited focus more on *Calamagrostis canadensis* (bluejoint) on richer, less saline sites.

Deschampsia cespitosa Habitat Type
(Tufted Hair Grass Habitat Type)

DESCCES

Number of Stands Sampled = 14

Number of Stands Sampled in Saskatchewan = 6

LOCATION AND ASSOCIATED LANDFORMS

The *Deschampsia cespitosa* (tufted hair grass) habitat type is a minor type at low elevations in southern Saskatchewan. The type occurs on a variety of landforms including basins, wet meadows, nearly level stream terraces, and seep areas.

VEGETATION

In southeastern Saskatchewan, *Deschampsia cespitosa* (tufted hair grass) is found mostly in association with alkali tolerant species. *Deschampsia cespitosa* (tufted hair grass), when undisturbed, usually forms a dense stand of individual tussocks. Associated species that increase with disturbance include *Hordeum jubatum* (foxtail barley), *Distichlis stricta* (salt grass), and *Poa palustris* (fowl bluegrass) (Table 59).

Table 59. Average canopy cover, range of canopy cover, and constancy for species recorded on 6 late seral to climax stands of the *Deschampsia cespitosa* (tufted hair grass) habitat type

TABLE 59.	**% Can. Cov.**		
Species	**Avg.**	**Rng.**	**Con.**
Graminoids			
Agropyron smithii (western wheat grass)	1	0-1	17
Agropyron trachycaulum (slender wheat grass)	3	0-3	17
Deschampsia cespitosa (tufted hair grass)	77	60-90	100
Distichlis stricta (salt grass)	2	0-3	33
Eleocharis palustris (creeping spike-rush)	20	0-20	17
Hordeum jubatum (foxtail barley)	4	0-10	67
Juncus balticus (wire rush)	3	0-3	17
Scirpus pungens (three-square rush)	20	0-20	17
Forbs			
Kochia scoparia (summer-cypress)	1	0-1	17
Salicornia europaea (samphire)	3	0-3	17

SUCCESSIONAL INFORMATION

The highly palatable *Deschampsia cespitosa* (tufted hair grass) may once have occupied greater area, but through long term heavy grazing, has been eliminated from much of its former range. On relatively undisturbed sites *Deschampsia cespitosa* (tufted hair grass) dominates over other herbaceous species. Litter is thick on drier sites but may be absent on moist sites. Moderate grazing reduces reproductive potential and vigour of *Deschampsia cespitosa* (tufted hair grass) by reduced seed head production and depletion of carbohydrate reserves. Under heavy grazing, its vigour is further reduced until other species gain dominance. Severely disturbed dry sites become dominated by graminoids such as *Hordeum jubatum* (foxtail barley) and *Poa palustris* (fowl bluegrass), and have an abundance of disturbance-related forbs (Table 60).

Table 60. Average canopy cover, range of canopy cover, and constancy for species recorded in 8 disturbed and/or early to mid-seral stands of the *Deschampsia cespitosa* (tufted hair grass) habitat type

TABLE 60.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Shrubs			
Salix exigua (sandbar willow)	1	0-1	13
Graminoids			
Agrostis scabra (rough hair grass)	30	0-30	13
Agropyron smithii (western wheat grass)	10	0-10	13
Agropyron trachycaulum (slender wheat grass)	10	0-10	13
Calamagrostis canadensis (bluejoint)	1	0-1	13
Carex atherodes (awned sedge)	10	0-10	13
Carex lanuginosa (woolly sedge)	3	0-3	13
Carex vesicaria (blister sedge)	1	0-1	13
Deschampsia cespitosa (tufted hair grass)	70	30-90	100
Distichlis stricta (salt grass)	10	0-10	13
Eleocharis palustris (creeping spike-rush)	3	0-3	13
Hordeum jubatum (foxtail barley)	7	0-20	63
Juncus balticus (wire rush)	1	0-1	25
Poa palustris (fowl bluegrass)	10	0-10	25
Poa pratensis (Kentucky bluegrass)	1	0-1	13
Forbs			
Arnica chamissonis (leafy arnica)	30	0-30	13
Aster ascendens (western aster)	40	0-40	13
Aster borealis (marsh aster)	1	0-1	13
Aster ericoides (tufted white prairie aster)	3	0-3	13
Astragalus alpinus (alpine milk vetch)	1	0-1	13
Chenopodium fremontii (Fremont's goosefoot)	1	0-1	13
Chenopodium leptophyllum (narrow-leaved goosefoot)	1	0-1	13
Cirsium arvense (Canada thistle)	1	0-1	13
Comandra umbellata (bastard toadflax)	40	0-40	13
Helenium autumnale (sneezeweed)	1	0-1	13
Kochia scoparia (summer-cypress)	3	0-3	13
Mentha arvensis (wild mint)	3	0-3	13
Potentilla anserina (silverweed)	40	0-40	13
Potentilla gracilis (graceful cinquefoil)	1	0-1	13
Rumex triangulivalvis (narrow-leaved dock)	1	0-1	13
Salicornia europaea (samphire)	3	0-3	13
Senecio cymbalarioides (ragwort)	10	0-10	13
Suaeda calceoliformis (western sea-blite)	10	0-10	13

SOILS

Soils are generally Brown Chernozems and Regosols. Texture is commonly silt loam. Water tables at or slightly above the soil surface are common in spring, often dropping below 1 m (39 in) of the surface in summer on drier sites. Wetter stands, having year-long water tables above 1 m (39 in) depth, commonly have some accumulation of organic material at the soil surface. Redox concentrations (mottles) near the soil surface are common, indicating a seasonally high water table.

ADJACENT COMMUNITIES

Adjacent wetter communities at mid elevation include the *Scirpus pungens* (three-square rush) and *Eleocharis palustris* (creeping spike-rush) habitat types. Adjacent drier communities include a variety of shrub and herbaceous types such as the *Artemisia cana/Agropyron smithii* (silver sagebrush/western wheat grass) habitat type and the *Hordeum jubatum* (foxtail barley) community type.

MANAGEMENT INFORMATION

Livestock

Herbage production in the *Deschampsia cespitosa* (tufted hair grass) habitat type is moderate to high, ranging from 500 to 3,000 lbs/acre dry weight. Sites receive heavy livestock pressure because it typically dries in the upper soil and is relatively palatable, especially to cattle.

Suitability for sheep is not as great because the type has few forbs. Under season long grazing, *Deschampsia cespitosa* (tufted hair grass) may be replaced by *Hordeum jubatum* (foxtail barley) and *Poa palustris* (fowl bluegrass). To maintain vigour and prevent damage to soils and vegetation, grazing should be deferred until soils dry. Light to moderate levels of grazing is most appropriate.

In order to develop an upward trend in ecological status on moderately disturbed sites, time the season of use by livestock to both the drying of the soil surface and to the maturation of the seed heads (Kovalchik 1987). Livestock should be removed before 40 percent of herbaceous forage is taken.

On severely disturbed sites, more intensive rehabilitation strategies will be required due to displacement of *Deschampsia cespitosa* (tufted hair grass) by *Hordeum jubatum* (foxtail barley), *Poa palustris* (fowl bluegrass), and disturbance-related forbs.

Frisina (1991) states that for a grazing program to be successful, it must meet the basic biological requirements of the plants present. These are photosynthesis, food storage, reproduction, and seedling establishment. In order to meet these requirements, long periods of rest are needed. It is during the long growing season rest periods that these essential biological processes of food production and storage, reproduction, and seedling establishment occur. In some instances, additional periods of rest may be required to improve or maintain a plant community.

Wildlife

Sites supporting the *Deschampsia cespitosa* (tufted hair grass) habitat type provide food and cover for deer and waterfowl (Dittberner and Olson 1983). Care should be taken to avoid use conflicts between livestock and wildlife.

Fisheries

This type is usually separated from open water by a zone dominated by *Salix* species (willow) or *Carex* species (sedge). However, where it is adjacent to streams, the weak fibrous root system of *Deschampsia cespitosa* (tufted hair grass) has little value for stabilizing streambanks (Youngblood and others 1985b).

Fire

Deschampsia cespitosa (tufted hair grass) is resistant to damage from fire (DeBenedetti and Parsons 1984). Root crowns are rarely damaged, even by hot intense fires. However, repeated burning of this habitat type favours rhizomatous species such as *Poa palustris* (fowl bluegrass). Burning should be postponed if livestock are present, to avoid attracting animals to young, palatable regrowth of *Deschampsia cespitosa* (tufted hair grass).

Soil Management and Rehabilitation Opportunities

Moist soils are readily compacted by animal and vehicular traffic. Seasonally high water tables common to this type can make soils particularly susceptible to compaction. In most cases, roads and trails should be located on the uplands outside this type.

Although widely recommended for use in revegetation efforts, *Deschampsia cespitosa* (tufted hair grass) shows little potential for streambank rehabilitation due to its thin fibrous root structure (Youngblood and others 1985b).

Recreational Uses and Considerations

The sites provide opportunities for viewing big game during the summer and fall. Those sites adjacent to streams provide access points for fishing.

OTHER STUDIES

A *Deschampsia cespitosa* (tufted hair grass) habitat type is described by Hansen and others (1995) in Montana. Other similar communities have been described by Mueggler and Stewart (1980) for western Montana [*Deschampsia cespitosa/Carex* species (tufted hair grass/sedge) habitat type], by Youngblood and others (1985b) for eastern Idaho and western Wyoming, by Kovalchik (1987) for central Oregon, by Tuhy and Jensen (1982) for Idaho, by Padgett and others (1989) for Utah and southeastern Idaho, by Ratliff (1982) for the Sierra Nevada's in California, and by Franklin and Dyrness (1973) for Oregon and Washington.

Distichlis stricta Habitat Type
(Salt Grass Habitat Type)

DISTSTR
Number of Stands Sampled = 25
Number of Stands Sampled in Saskatchewan = 7

LOCATION AND ASSOCIATED LANDFORMS

The *Distichlis stricta* (salt grass) habitat type is a minor type in the Mixed Grassland Ecoregion of southern Saskatchewan. The type is found in saline or alkali basins, swales, pond and lake margins, and seep areas.

VEGETATION

The *Distichlis stricta* (salt grass) habitat type is usually identified by a relatively pure stand of *Distichlis stricta* (salt grass) with scattered patches of *Puccinellia nuttalliana* (Nuttall's salt-meadow grass) (Table 61).

Table 61. Average canopy cover, range of canopy cover, and constancy for species recorded in 9 late seral to climax stands of the *Distichlis stricta* (salt grass) habitat type

TABLE 61.	**% Can. Cov.**		
Species	**Avg.**	**Rng.**	**Con.**
Graminoids			
Deschampsia cespitosa (tufted hair grass)	3	0-3	11
Distichlis stricta (salt grass)	64	50-80	100
Puccinellia nuttalliana (Nuttall's salt-meadow grass)	2	0-3	22
Forbs			
Salicornia europaea (samphire)	3	0-3	22
Salsola kali (Russian-thistle)	1	0-1	11
Suaeda calceoliformis (western sea-blite)	2	0-3	22
Triglochin maritima (seaside arrow-grass)	1	0-1	11

SUCCESSIONAL INFORMATION

High use of this habitat type will normally weaken the associated perennial grasses, such as *Puccinellia nuttalliana* (Nuttall's salt-meadow grass). With prolonged heavy use, *Hordeum jubatum* (foxtail barley) and a variety of disturbance-related, alkali tolerant forbs may replace *Distichlis stricta* (salt grass) (Table 62).

Table 62. Average canopy cover, range of canopy cover, and constancy for species recorded in 16 early to mid seral or disturbed stands of the *Distichlis stricta* (salt grass) habitat type

TABLE 62.	**% Can. Cov.**		
Species	**Avg.**	**Rng.**	**Con.**
Shrubs			
Artemisia tridentata (big sagebrush)	1	0-1	6
Chrysothamnus viscidiflorus (green rabbitbrush)	1	0-1	13
Sarcobatus vermiculatus (greasewood)	1	0-1	19
Suaeda moquinii (Moquin's sea-blite)	1	0-1	6
Graminoids			
Agropyron smithii (western wheat grass)	6	0-20	25
Bouteloua gracilis (blue grama)	3	0-3	6
Carex filifolia (thread-leaved sedge)	1	0-1	6

TABLE 62.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Deschampsia cespitosa (tufted hair grass)	7	0-10	13
Distichlis stricta (salt grass)	65	20-98	100
Hordeum jubatum (foxtail barley)	9	0-40	50
Koeleria macrantha (June grass)	20	0-20	6
Muhlenbergia cuspidata (plains muhly)	20	0-20	6
Panicum capillare (witch grass)	10	0-10	6
Poa arida (plains bluegrass)	1	0-1	6
Poa compressa (Canada bluegrass)	3	0-3	6
Puccinellia nuttalliana (Nuttall's salt-meadow grass)	9	0-20	56
Scirpus pungens (three-square rush)	2	0-3	13
Sitanion hystrix (squirreltail)	3	0-3	6
Spartina gracilis (alkali cord grass)	20	0-20	6
Stipa viridula (green needle grass)	1	0-1	6
Forbs			
Achillea sibirica (many-flowered yarrow)	1	0-1	6
Amaranthus spp. (amaranth, pigweed)	3	0-3	6
Artemisia frigida (pasture sagewort)	1	0-1	6
Artemisia ludoviciana (prairie sagewort)	1	0-1	6
Aster ascendens (western aster)	1	0-1	6
Aster ericoides (tufted white prairie aster)	1	0-1	6
Aster spp. (aster)	1	0-1	6
Atriplex prostrata (prostrate saltbush)	3	0-3	6
Chenopodium album (lamb's-quarters)	10	0-10	6
Chenopodium fremontii (Fremont's goosefoot)	1	0-1	6
Chenopodium spp. (goosefoot)	1	0-1	6
Chenopodium watsonii (Watson's goosefoot)	1	0-1	6
Unknown Forb	1	0-1	6
Glycyrrhiza lepidota (wild licorice)	12	0-20	13
Grindelia squarrosa (gumweed)	2	0-3	31
Gutierrezia sarothrae (broomweed)	1	0-1	6
Haplopappus lanceolatus (lance-leaved ironplant)	1	0-1	6
Haplopappus spp. (goldenweed)	3	0-3	6
Kochia scoparia (summer-cypress)	3	0-3	13
Monolepis nuttalliana (spear-leaved goosefoot)	1	0-1	6
Phlox hoodii (moss phlox)	1	0-1	6
Potentilla anserina (silverweed)	1	0-1	6
Salicornia europaea (samphire)	2	0-3	19
Suaeda calceoliformis (western sea-blite)	22	0-80	25
Triglochin maritima (seaside arrow-grass)	3	0-3	6

SOILS

Parent material is commonly alluvium. Soils are typically Brown Chernozems. Texture ranges from clay to silt loam. Water tables usually remain at or slightly below the soil surface. Soil reaction is commonly alkaline (pH 8.0). Soils of this type characteristically have high concentrations of soluble salts (saline soils).

ADJACENT COMMUNITIES

This type is often at the lowest (wettest) level of the local drainage. On other sites, the adjacent wetter communities may be dominated by the *Scirpus* species (bulrush), *Juncus balticus* (wire rush), or *Puccinellia nuttalliana* (Nuttall's salt-meadow grass). Drier communities may be dominated by *Sarcobatus vermiculatus* (greasewood), *Symphoricarpos occidentalis* (buckbrush), or a variety of upland communities.

MANAGEMENT INFORMATION

Livestock

Forage production in this type rates as low. *Distichlis stricta* (salt grass) is not particularly palatable, but as other forages dry up, livestock may make considerable use of it (Johnson and Nichols 1982). On the other hand, the associated grass *Puccinellia nuttalliana* (Nuttall's salt-meadow grass) is moderately palatable to livestock. With prolonged heavy use, *Hordeum jubatum* (foxtail barley) may replace *Distichlis stricta* (salt grass) and *Puccinellia nuttalliana* (Nuttall's salt-meadow grass).

Wildlife

Due to the short stature of plants of the *Distichlis stricta* (salt grass) habitat type, it is of limited value as wildlife habitat.

Fire

Fire is not much of a problem, nor does it have much utility, in this type due to the limited amounts of flammable fuels.

Soil Management and Rehabilitation Opportunities

The high clay content and saline nature common to theses soils make them extremely susceptible to compaction. They present limitations to development. New trails or roads should be located on the adjacent uplands.

On degraded saline/alkaline sites, *Distichlis stricta* (salt grass) can be transplanted. Its rhizomatous growth habit allows it to quickly spread across suitable sites.

Recreational Uses and Considerations

Recreational use of this type is extremely limited. Campsites, roads, and trails should located elsewhere due to the high clay content of this type.

OTHER STUDIES

The *Distichlis stricta* (salt grass) habitat type is described by Hansen and others (1995) for Montana. Hanson and Whitman (1938) described a similar type for western North Dakota. Daubenmire (1970) described a *Distichlis stricta* (salt grass) habitat type consisting of a pure stand of *Distichlis stricta* (salt grass) occurring in saline/alkaline areas of eastern Washington. Michalsky and others (1994) describe an Alkali Grass-Nuttall's Salt Meadow Grass vegetation type on the Grasslands National Park in extreme southern Saskatchewan.

Eleocharis palustris Habitat Type
(Creeping Spike-rush Habitat Type)

ELEOPAL
Number of Stands Sampled = 31
Number of Stands Sampled in Saskatchewan = 13

Note: The *Eleocharis palustris* (creeping spike-rush) habitat type includes all combinations of *Eleocharis palustris* (creeping spike-rush) and *Eleocharis acicularis* (needle spike-rush) due to similarities in environmental conditions and management concerns.

LOCATION AND ASSOCIATED LANDFORMS

The *Eleocharis palustris* (creeping spike-rush) habitat type is a minor type throughout the Grassland Ecoregions of Saskatchewan, and an incidental type in both the Cypress Upland and Aspen Parkland Ecoregions. It typically occurs on somewhat alkaline sites in narrow bands prone to yearly flooding, along stream, rivers, lake margins, and reservoirs.

VEGETATION

Typically, stands are almost pure *Eleocharis palustris* (creeping spike-rush). The small-statured *Eleocharis acicularis* (needle spike-rush) is also common (Table 63).

Table 63. Average canopy cover, range of canopy cover, and constancy for species recorded in 18 late seral to climax stands of the *Eleocharis palustris* (creeping spike-rush) habitat type

TABLE 63.	**% Can. Cov.**		
Species	**Avg.**	**Rng.**	**Con.**
Graminoids			
Beckmannia syzigachne (slough grass)	1	0-1	6
Carex atherodes (awned sedge)	1	0-1	6
Eleocharis palustris (creeping spike-rush)	88	60-98	100
Hordeum jubatum (foxtail barley)	1	0-1	11
Scirpus acutus (great bulrush)	1	0-1	6
Scirpus paludosus (prairie bulrush)	3	0-3	6
Scirpus pungens (three-square rush)	3	0-3	6
Forbs			
Polygonum amphibium (water smartweed)	3	0-3	11
Polygonum persicaria (lady's-thumb)	1	0-1	6
Polygonum ramosissimum (bushy knotweed)	1	0-1	6
Potamogeton gramineus (various-leaved pondweed)	1	0-1	6
Potentilla anserina (silverweed)	3	0-3	6
Ranunculus abortivus (small-flowered buttercup)	3	0-3	6
Ranunculus cymbalaria (seaside buttercup)	3	0-3	6
Rumex crispus (curled dock)	1	0-1	11
Rumex triangulivalvis (narrow-leaved dock)	3	0-3	6
Triglochin maritima (seaside arrow-grass)	3	0-3	6

SUCCESSIONAL INFORMATION

Eleocharis palustris (creeping spike-rush) is an early colonizer of suitable habitats and can persist under wet conditions. Under continuous saturation and due to the aggressive characteristic of *Eleocharis palustris*, (creeping spike-rush) most other species are precluded.

Disturbance can dramatically decrease the cover of *Eleocharis palustris* (creeping spike-rush) and increase the presence of such invader species as the annual *Beckmannia syzigachne* (slough grass), *Hordeum jubatum* (foxtail barley), and various other opportunistic forbs (Table 64).

Table 64. Average canopy cover, range of canopy cover, and constancy for species recorded in 13 disturbed and/or early to mid-seral stands of the *Eleocharis palustris* (creeping spike-rush) habitat type

TABLE 64.	**% Can. Cov.**		
Species	**Avg.**	**Rng.**	**Con.**
Shrubs			
Salix exigua (sandbar willow)	3	0-3	8
Salix lutea (yellow willow)	3	0-3	8
Graminoids			
Agrostis stolonifera (redtop)	10	0-20	15
Alopecurus aequalis (short-awned foxtail)	20	0-20	8
Beckmannia syzigachne (slough grass)	2	0-3	46
Carex atherodes (awned sedge)	3	0-3	8
Carex rostrata (beaked sedge)	3	0-3	8
Carex sychnocephala (long-beaked sedge)	3	0-3	8
Eleocharis palustris (creeping spike-rush)	67	40-98	100
Glyceria grandis (common tall manna grass)	1	0-1	15
Hordeum jubatum (foxtail barley)	3	0-3	15
Juncus balticus (wire rush)	60	0-60	8
Phalaris arundinacea (reed canary grass)	2	0-3	15
Puccinellia nuttalliana (Nuttall's salt-meadow grass)	1	0-1	8
Scirpus acutus (great bulrush)	5	0-10	23
Scirpus paludosus (prairie bulrush)	3	0-3	8
Scirpus validus (common great bulrush)	1	0-1	8
Forbs			
Cirsium arvense (Canada thistle)	3	0-3	8
Epilobium leptophyllum (narrow-leaved willowherb)	3	0-3	8
Epilobium palustre (marsh willowherb)	10	0-10	8
Mentha arvensis (wild mint)	2	0-3	15

TABLE 64.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Polygonum amphibium (water smartweed)	1	0-1	8
Polygonum lapathifolium (pale persicaria)	20	0-20	8
Ranunculus cymbalaria (seaside buttercup)	25	0-30	15
Rumex crispus (curled dock)	20	0-20	8
Sagittaria latifolia (broad-leaved arrowhead)	1	0-1	8
Senecio conterminus (Arctic butterweed)	2	0-3	15
Sonchus spp. (sow-thistle)	3	0-3	8
Sparganium eurycarpum (giant bur-reed)	10	0-10	8
Triglochin maritima (seaside arrow-grass)	3	0-3	8
Triglochin palustris (slender arrow-grass)	1	0-1	8
Typha latifolia (common cattail)	1	0-1	8
Ferns and Allies			
Equisetum arvense (common horsetail)	20	0-20	8
Equisetum hyemale (common scouring-rush)	40	0-40	8

SOILS

The *Eleocharis palustris* (creeping spike-rush) habitat type occurs on Organic soils, Chernozemic, and occasionally on Regosols. Organic accumulations at the surface are common. Texture is commonly fine silt or clay. These sites are generally inundated throughout much of the growing season.

ADJACENT COMMUNITIES

Adjacent wetter sites may support stands of *Scirpus acutus* (great bulrush) or are open water. Slightly drier riparian or wetland sites are dominated by graminoids such as *Carex atherodes* (awned sedge), *Juncus balticus* (wire rush), and *Poa palustris* (fowl bluegrass).

MANAGEMENT INFORMATION

Livestock

Seasonally wet conditions and the low palatability of *Eleocharis palustris* (creeping spike-rush) and *Eleocharis acicularis* (needle spike-rush) limit the grazing value of this type for livestock. Use of this type is often greater in drought years due to the limited availability and palatability of upland forage. Stands typically are so small that they are not important for their forage value.

Wildlife

Broader bands of this type along some streams, rivers, lakes, and reservoirs do provide valuable feeding and nesting areas for waterfowl. *Eleocharis palustris* (creeping spike-rush) and associated plants are a valuable source of food and cover for waterfowl.

Fisheries

Eleocharis palustris (creeping spike-rush), along with other shallow water emergent species, provides critical springtime spawning habitat for pike (Harrison 2000).

Soil Management and Rehabilitation Opportunities

These sites are generally so wet as to preclude most development. Trampling damage and soil churning occurs readily with livestock use.

OTHER STUDIES

The *Eleocharis palustris* (creeping spike-rush) habitat type is described by Hansen and others (1995) in Montana. Similar communities have been described by Kovalchik (1987), by Ratliff (1982), by Chadde and others (1988), and by Padgett and others (1989).

Hordeum jubatum Community Type
(Foxtail Barley Community Type)

HORDJUB

Number of Stands Sampled = 17

Number of Stands Sampled in Saskatchewan = 7

LOCATION AND ASSOCIATED LANDFORMS

The *Hordeum jubatum* (foxtail barley) community type is a minor type at low elevations in the Prairie Ecozone of southern Saskatchewan. This community type occurs often in the drawdown zone of lakes and ponds or ephemeral depressions with moderately saline or alkali water. These sites are flooded during the early part of the growing season but the water table falls below the soil surface by late spring or early summer. These communities often occur in narrow bands concentric with the open water.

VEGETATION

Vegetative diversity is very low. *Hordeum jubatum* (foxtail barley) generally dominates with a few various alkali tolerant species, mostly forbs, occasionally present (Table 65).

Table 65. Average canopy cover, range of canopy cover, and constancy for those species recorded in the 17 sampled stands of the *Hordeum jubatum* (foxtail barley) community type

TABLE 65.	**% Can. Cov.**		
Species	**Avg.**	**Rng.**	**Con.**
Graminoids			
Agropyron smithii (western wheat grass)	12	0-20	12
Agrostis stolonifera (redtop)	10	0-10	6
Alopecurus aequalis (short-awned foxtail)	1	0-1	6
Beckmannia syzigachne (slough grass)	3	0-3	6
Distichlis stricta (salt grass)	1	0-1	6
Eleocharis palustris (creeping spike-rush)	10	0-10	6
Unknown Grass	3	0-3	6
Hordeum jubatum (foxtail barley)	84	40-98	100
Juncus balticus (wire rush)	1	0-1	6
Poa palustris (fowl bluegrass)	10	0-10	6
Puccinellia cusickii (Cusick's salt-meadow grass)	3	0-3	6
Puccinellia nuttalliana (Nuttall's salt-meadow grass)	3	0-10	24
Scirpus acutus (great bulrush)	1	0-1	6
Scirpus pungens (three-square rush)	3	0-3	6
Forbs			
Artemisia biennis (biennial sagewort)	3	0-3	6
Aster brachyactis (rayless aster)	3	0-3	12
Atriplex spp. (atriplex)	10	0-10	6
Atriplex prostrata (prostrate saltbush)	14	0-30	18
Chenopodium fremontii (Fremont's goosefoot)	18	0-40	18
Chenopodium spp. (goosefoot)	20	0-20	6
Chenopodium rubrum (red goosefoot)	1	0-1	6
Descurainia pinnata (green tansy mustard)	20	0-20	6
Glycyrrhiza lepidota (wild licorice)	1	0-1	6
Helianthus spp. (sunflower)	1	0-1	6
Kochia scoparia (summer-cypress)	2	0-3	12
Lactuca serriola (prickly lettuce)	3	0-3	6
Melilotus alba (white sweet-clover)	1	0-1	6
Mentha arvensis (wild mint)	1	0-1	6
Polygonum amphibium (water smartweed)	3	0-3	6
Ranunculus cymbalaria (seaside buttercup)	3	0-3	6
Rumex crispus (curled dock)	3	0-3	12
Rumex triangulivalvis (narrow-leaved dock)	1	0-1	6
Salicornia europaea (samphire)	2	0-3	24
Sonchus arvensis (perennial sow-thistle)	5	0-10	12
Taraxacum officinale (common dandelion)	1	0-1	6
Triglochin maritima (seaside arrow-grass)	1	0-1	6
Triglochin palustris (slender arrow-grass)	1	0-1	6

SUCCESSIONAL INFORMATION

In many situations, the *Hordeum jubatum* (foxtail barley) community type represents an early seral (pioneer) stage that will be eventually taken over by a variety of later successional species. Close observation of similar sites may give insight to the climax community for the site. In other situations, the *Hordeum jubatum* (foxtail barley) community type may represent an early seral grazing disclimax of any of several habitat types, including the *Distichlis stricta* (salt grass) habitat type, and the *Agropyron smithii* (western wheat grass) habitat type.

SOILS

Soils are typically fine textured and poorly to very poorly drained. Water tables remain at or slightly below the soil surface. On the Blackfeet Indian Reservation in Montana, Lesica and Shelly (1988) found conductivities to range from 2,150 to 41,000 uhmos/cm (a median of 16,350 uhmos/cm).

ADJACENT COMMUNITIES

Adjacent wetter communities are usually occupied by the *Eleocharis palustris* (creeping spike-rush) habitat type, the *Scirpus pungens* (three-square rush), or open water. Adjacent drier communities may be dominated by a variety of upland communities.

MANAGEMENT INFORMATION

Livestock

Herbage production from the *Hordeum jubatum* (foxtail barley) community type is low. Palatability of *Hordeum jubatum* (foxtail barley) when young is fair for livestock, but little use is made after seed heads develop (USDA Forest Service 1937, Johnson and Nichols 1982). Consuming the awned seed heads can cause severe mouth sores or occasionally death. Injuries to wildlife such as elk, deer, and pronghorn have also been documented (USDA Forest Service 1937).

Hordeum jubatum (foxtail barley) is an increaser under excessive grazing pressure, and quickly invades suitable sites (USDA Forest Service 1937). Light to moderate grazing may allow desired species to regain dominance.

Wildlife

Low herbage production and palatability makes this community type of limited value for wildlife. Consuming the mature awned seed heads can cause severe mouth sores or occasionally death. Injuries to wildlife such as elk, deer, and pronghorn have also been documented (USDA Forest Service 1937).

Soil Management and Rehabilitation Opportunities

Most management concerns associated with this type are concerning increased salinity. The presence or expansion of saline seep areas may indicate that upland vegetation, small grains, fallow fields, or excessive irrigation are not allowing the water table to drop to levels these sites have routinely experienced in the past. Excess water migrates through the soil, gathering soluble salts, and evaporating in depressions. The salts precipitate, concentrating over time, thereby restricting the number of plant species able to tolerate conditions on the site. It is important to note that saline areas also occur naturally in these conditions of arid climate, parent material, and local topography.

OTHER STUDIES

A type similar to the *Hordeum jubatum* (foxtail barley) community type has been described by Lesica and Shelly (1988) for the Blackfeet Indian Reservation of Montana. Michalsky and others (1994) describe a Foxtail Barley-Dock vegetation type on the Grasslands National Park in extreme southern Saskatchewan.

Juncus balticus Community Type
(Wire Rush Community Type)

JUNCBAL

Number of Stands Sampled = 14

Number of Stands Sampled in Saskatchewan = 1

LOCATION AND ASSOCIATED LANDFORMS

The *Juncus balticus* (wire rush) community type is a minor type on low to mid elevation riparian or wetland disturbed environments in the Mixed Grassland Ecoregion and an incidental type on those same environmental positions in the remaining portions of the southern Saskatchewan Prairie Ecozone. This type occurs near seeps, in meadows, and on alluvial terraces that have been heavily grazed for many years. Surface topography is usually level or sometimes undulating.

VEGETATION

The *Juncus balticus* (wire rush) community type is a grazing disclimax. *Juncus balticus* (wire rush) dominates the community. Common associates of this disturbance-caused type may include *Hordeum jubatum* (foxtail barley) and any of a large list of occasional disturbance-related herbaceous species (Table 66).

Table 66. Average canopy cover, range of canopy cover, and constancy for species recorded in 14 sampled stands of the grazing disclimax *Juncus balticus* (wire rush) community type

TABLE 66.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Trees			
Populus balsamifera (balsam poplar)	1	0-1	7
Shrubs			
Potentilla fruticosa (shrubby cinquefoil)	1	0-1	7
Salix exigua (sandbar willow)	1	0-1	7
Salix planifolia (flat-leaved willow)	1	0-1	7
Graminoids			
Agropyron dasystachyum (northern wheat grass)	3	0-3	7
Agropyron spicatum (bluebunch wheat grass)	10	0-10	7
Agrostis stolonifera (redtop)	2	0-3	14
Beckmannia syzigachne (slough grass)	3	0-3	7
Bromus inermis (awnless brome)	1	0-1	7
Calamagrostis canadensis (bluejoint)	4	0-10	21
Calamagrostis inexpansa (northern reed grass)	1	0-1	7
Calamagrostis stricta (narrow reed grass)	1	0-1	7
Carex douglasii (Douglas sedge)	1	0-1	7
Carex lanuginosa (woolly sedge)	2	0-3	14
Carex rostrata (beaked sedge)	3	0-3	7
Deschampsia cespitosa (tufted hair grass)	3	0-3	14
Hordeum jubatum (foxtail barley)	17	0-60	50
Juncus balticus (wire rush)	84	60-98	100
Muhlenbergia asperifolia (scratch grass)	1	0-1	7
Phleum pratense (timothy)	1	0-1	7
Poa compressa (Canada bluegrass)	10	0-10	7
Poa palustris (fowl bluegrass)	12	0-20	14
Poa pratensis (Kentucky bluegrass)	10	0-20	14
Polypogon monspeliensis (rabbitfoot grass)	1	0-1	7
Puccinellia nuttalliana (Nuttall's salt-meadow grass)	1	0-1	7
Forbs			
Aster hesperius (western willow aster)	1	0-1	7
Aster spp. (aster)	3	0-3	7
Cardamine pratensis (meadow bitter cress)	20	0-20	7
Centaurea maculosa (spotted knapweed)	1	0-1	7
Cirsium arvense (Canada thistle)	1	0-1	7
Dodecatheon spp. (shooting star)	3	0-3	7
Epilobium ciliatum (northern willowherb)	3	0-3	7
Epilobium glaberrimum (willowherb)	20	0-20	7
Glycyrrhiza lepidota (wild licorice)	1	0-1	7

TABLE 66.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Lactuca serriola (prickly lettuce)	10	0-10	7
Mentha arvensis (wild mint)	10	0-20	14
Polygonum amphibium (water smartweed)	3	0-3	14
Ranunculus cymbalaria (seaside buttercup)	3	0-3	7
Rumex occidentalis (western dock)	1	0-1	7
Senecio indecorus (rayless ragwort)	40	0-40	7
Solidago missouriensis (low goldenrod)	3	0-3	7
Sonchus arvensis (perennial sow-thistle)	10	0-10	7
Sonchus uliginosus (smooth perennial sow-thistle)	1	0-1	7
Taraxacum officinale (common dandelion)	1	0-1	7
Triglochin maritima (seaside arrow-grass)	7	0-10	14
Ferns and Allies			
Equisetum arvense (common horsetail)	1	0-1	7

SUCCESSIONAL INFORMATION

The *Juncus balticus* (wire rush) community type represents a grazing disclimax. Numerous fence line contrasts illustrate that it acts as an increaser and/or an invader. This community type occurs over a wide range of environmental conditions. It usually increases on sites formally held by the *Deschampsia cespitosa* (tufted hair grass) or the *Carex aquatilis* (water sedge) habitat types. It is considered an increaser due to its high tolerance to grazing. Utilization of the *Juncus balticus* (wire rush) may be partially responsible for the numerous disturbance-related species often associated with it. In other situations, *Juncus balticus* (wire rush) appears to have increased with disturbance, replacing other riparian or wetland graminoids.

The presence of nearly pure stands of *Juncus balticus* (wire rush) usually indicates wetter phases of this type and sites, which have been heavily grazed. *Deschampsia cespitosa* (tufted hair grass) occurs on sites of intermediate moisture, while *Poa* species (bluegrass) indicates drier conditions and previous site disturbance.

SOILS

Soils are Brown and Dark Brown Chernozems, or rarely Regosols. Texture ranges from silt to sandy loam. Water tables are often at or near the soil surface in early summer, but may drop below 50 cm (20 in) by late August. Soil reaction ranges from neutral to mildly alkaline (pH 7.0 to 8.0).

ADJACENT COMMUNITIES

A variety of types occupy adjacent wetter sites, including the *Salix* (willow) habitat and community types, *Typha latifolia* (common cattail), *Scirpus acutus* (great bulrush), *Carex aquatilis* (water sedge), and *Carex atherodes* (awned sedge) habitat types. The *Carex lanuginosa* (woolly sedge) habitat type and the *Poa pratensis* (Kentucky bluegrass) community type are common on adjacent sites with similar or slightly drier moisture regimes.

MANAGEMENT INFORMATION

Livestock

Stands of this type are productive, but forage value is relatively low. Hermann (1975) reported grazing usage when plants were young and tender. As it matures, it is commonly avoided. Heavy grazing generally results in an increase of less palatable forbs. The palatability of *Hordeum jubatum* (foxtail barley), the most commonly associated species, is also low.

Numerous fence line contrasts illustrate that *Juncus balticus* (wire rush) acts as an increaser and/or invader on disturbed sites.

Wildlife
This type provides early season forage for wildlife, especially in stands having a large grass component.

Fisheries
Juncus balticus (wire rush) produces a deep and fibrous root system, with a mass of coarse, creeping rhizomes, and once established, rapidly spreads. These soil-holding characteristics make it valuable for stabilizing streambanks.

Fire
The limited information on the effects of fire on *Juncus balticus* (wire rush) suggests that is not harmed by cool fires. Associated species such as *Poa pratensis* (Kentucky bluegrass) are damaged only by hot, intense fire. Cool burns will have little effect on *Poa pratensis* (Kentucky bluegrass) (Volland and Dell 1981), but spring burns may lower tiller densities (Dix and Smeins 1967). Intense burns during active growing periods can severely damage stands of *Poa pratensis* (Kentucky bluegrass) (Wasser 1982).

Soil Management and Rehabilitation Opportunities
The fine textured soils associated with this community type are subject to compaction when moist, which results in lower productivity and community compositional changes that favour *Juncus balticus* (wire rush).

The strong rhizomes of *Juncus balticus* (wire rush) effectively stabilize of streambanks, especially where soils are coarse and otherwise unstable. Except for *Juncus balticus* (wire rush), the associated graminoids of this type provide small streambank protection.

OTHER STUDIES

The *Juncus balticus* (wire rush) community type is described by Hansen and others (1995). Other studies of the region have identified similar *Juncus balticus* (wire rush) communities, including Norton and others (1981), Mattson (1984), Youngblood and others (1985b), Chadde and others (1988), and Padgett and others (1989). Michalsky and others (1994) describe a Baltic Rush-Foxtail Barley vegetation type on the Grasslands National Park in extreme southern Saskatchewan.

Phalaris arundinacea Habitat Type
(Reed Canary Grass Habitat Type)

PHALARU
Number of Stands Sampled = 31
Number of Stands Sampled in Saskatchewan = 13

LOCATION AND ASSOCIATED LANDFORMS

The *Phalaris arundinacea* (reed canary grass) habitat type is a minor type in the Saskatchewan Prairie Ecozone. It occurs at low to mid elevations along streams, rivers, oxbows, lake and pond margins, ditches, irrigation channels, and in wet meadows. Although a native species, *Phalaris arundinacea* (reed canary grass) has been widely distributed as forage, and readily escapes from pastures into riparian or wetland areas, often displacing more desirable species.

VEGETATION

Stands are dominated by the tall *Phalaris arundinacea* (reed canary grass). *Phalaris arundinacea* (reed canary grass) is highly competitive with other riparian or wetland plants because of its heavy sod forming habit. Because of this, it tends to form dense, highly productive, monospecific stands that spread radially (Apfelbaum and Sams 1987). Due to its location near stream channels on alluvial deposits, pioneer species may be present in varying amounts (Table 67).

Table 67. Average canopy cover, range of canopy cover, and constancy for species recorded in 21 late seral to climax, or undisturbed, stands of the *Phalaris arundinacea* (reed canary grass) habitat type

TABLE 67.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Trees			
Populus deltoides (plains cottonwood)	1	0-1	5
Shrubs			
Rubus idaeus (wild red raspberry)	1	0-1	5
Salix exigua (sandbar willow)	2	0-3	10
Symphoricarpos albus (snowberry)	1	0-1	5
Graminoids			
Agropyron repens (quack grass)	1	0-1	5
Agrostis stolonifera (redtop)	1	0-1	5
Carex atherodes (awned sedge)	20	0-20	5
Carex vesicaria (blister sedge)	1	0-1	5
Hordeum jubatum (foxtail barley)	1	0-1	5
Phalaris arundinacea (reed canary grass)	96	90-98	100
Poa palustris (fowl bluegrass)	3	0-3	5
Poa pratensis (Kentucky bluegrass)	3	0-3	5
Forbs			
Apocynum cannabinum (Indian hemp)	1	0-1	10
Chenopodium album (lamb's-quarters)	1	0-1	5
Cirsium arvense (Canada thistle)	1	0-1	10
Mentha arvensis (wild mint)	7	0-10	14
Polygonum amphibium (water smartweed)	1	0-1	5
Rumex crispus (curled dock)	1	0-1	5
Urtica dioica (common nettle)	1	0-1	5
Xanthium strumarium (cocklebur)	1	0-1	5

SUCCESSIONAL INFORMATION

Phalaris arundinacea (reed canary grass) has a strong tolerance to grazing except in its early growth stages. However, if stands are severely impacted, species such as *Agrostis stolonifera* (redtop), *Cirsium arvense* (Canada thistle), *Polygonum amphibium* (water smartweed), and *Poa palustris* (fowl bluegrass) may invade the site (Table 68).

Table 68. Average canopy cover, range of canopy cover, and constancy for species recorded in 10 disturbed and/or early to mid-seral stands of the *Phalaris arundinacea* (reed canary grass) habitat type

TABLE 68.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Shrubs			
Salix exigua (sandbar willow)	1	0-1	10
Graminoids			
Agrostis stolonifera (redtop)	5	0-10	20
Agropyron trachycaulum (slender wheat grass)	1	0-1	10
Beckmannia syzigachne (slough grass)	3	0-3	10
Carex atherodes (awned sedge)	20	0-20	10
Carex sychnocephala (long-beaked sedge)	1	0-1	10
Eleocharis palustris (creeping spike-rush)	3	0-3	10
Hordeum jubatum (foxtail barley)	2	0-3	20
Phalaris arundinacea (reed canary grass)	89	50-98	100
Poa palustris (fowl bluegrass)	12	0-20	20
Scirpus acutus (great bulrush)	1	0-1	10
Scirpus microcarpus (small-fruited bulrush)	10	0-10	10
Forbs			
Apocynum cannabinum (Indian hemp)	3	0-3	10
Aster ericoides (tufted white prairie aster)	1	0-1	10
Aster modestus (large northern aster)	1	0-1	10
Centaurea maculosa (spotted knapweed)	1	0-1	10
Cirsium arvense (Canada thistle)	9	0-20	30
Epilobium ciliatum (northern willowherb)	1	0-1	10
Helenium autumnale (sneezeweed)	1	0-1	10
Melilotus alba (white sweet-clover)	10	0-10	10
Mentha arvensis (wild mint)	3	0-3	10

TABLE 68.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Polygonum amphibium (water smartweed)	8	0-10	30
Potentilla anserina (silverweed)	1	0-1	30
Rumex crispus (curled dock)	1	0-1	10
Sonchus asper (prickly annual sow-thistle)	1	0-1	10
Sonchus spp. (sow-thistle)	3	0-3	10
Stachys palustris (marsh hedge-nettle)	3	0-3	10
Taraxacum officinale (common dandelion)	1	0-1	10
Trifolium repens (white clover)	1	0-1	10
Triglochin maritima (seaside arrow-grass)	1	0-1	10
Urtica dioica (common nettle)	3	0-3	10
Ferns and Allies			
Equisetum arvense (common horsetail)	6	0-20	40

SOILS

Soils are typically Regosols or less frequently, Chernozems with fine texture and reactions ranging from slightly acid to moderately alkaline (pH 6.5 to 8.0) (USDA Soil Conservation Service 1968). Commonly, soils are poorly drained. Water tables may be above the soil surface for several months in spring, and soils often remain saturated throughout the growing season. *Phalaris arundinacea* (reed canary grass) tolerates prolonged periods of flooding. In fact, it is one of the most flood-tolerant of the cultivated grasses, yet it can withstand short summer droughts (Apfelbaum and Sams 1987).

ADJACENT COMMUNITIES

Adjacent wetter sites may include open water or the *Carex atherodes* (awned sedge), *Typha latifolia* (common cattail), *Scirpus acutus* (great bulrush), and *Eleocharis palustris* (creeping spike-rush) habitat types. Adjacent drier sites support a variety of species including: *Bromus inermis* (awnless brome), *Populus* (cottonwood), *Salix* (willow), and the *Acer negundo/Prunus virginiana* (Manitoba maple/choke cherry) habitat type.

MANAGEMENT INFORMATION

Livestock

Herbage production from the *Phalaris arundinacea* (reed canary grass) habitat type is high. However, palatability of the coarse *Phalaris arundinacea* (reed canary grass) is only low to moderate. It is most palatable when actively growing, and becomes less palatable in fall and winter. *Phalaris arundinacea* (reed canary grass) is strongly tolerant of grazing, except in the early growth stages. Increased alkaloid and fiber content with maturity cause a gradual decline in palatability. Grazing should begin when this species is about 30 cm (12 in) tall and soils have dried enough to minimize trampling damage (USDA Soil Conservation Service 1968). It is suggested that livestock producers graze it using intense stocking and a short rotation plan that leaves at least a 2-3 cm (5-8 in) stubble height. One management option may include mowing stands once a year and fencing to force cattle to use this species. To maintain dense stands, plants should not be grazed to less than 10 cm (4 in) in height (Alberta Agriculture 1981).

This type is also suitable for hay production. However, harvest must usually be delayed until late in the season when soils are dry and plants mature. Nutritive quality at this time is low, especially where *Phalaris arundinacea* (reed canary grass) completely dominates the stand.

Wildlife

In many locations, the *Phalaris arundinacea* (reed canary grass) habitat type is inundated long enough to provide some nesting habitat for waterfowl and cover for muskrats. Stands of this habitat type are also use by big game for forage and cover.

Fisheries
This habitat type may provide valuable spawning areas and hiding cover for many species of fish.

Fire
High water tables during the growing season make burning difficult. However, burning during the non-growing season may be feasible. A fire management strategy of a two to three year burn rotation has shown limited success in controlling the spread of *Phalaris arundinacea* (reed canary grass).

Soil Management and Rehabilitation Opportunities
These sites are generally so wet as to preclude most development activities. Even sites that dry out near the end of the growing season are highly susceptible to compaction due to fine textured soils.

Once established, *Phalaris arundinacea* (reed canary grass) spreads rapidly and is extremely difficult to eliminate (Apfelbaum and Sams 1987). The resilient nature of this rhizomatous grass makes it an effective stabilizer of streambanks and ditches. However, its future use in revegetating degraded sites should be restricted, and locally available. *Phalaris arundinacea* (reed canary grass) is becoming a threat to other native plant species in wetland areas. The effectiveness of control measures, such as burning and herbicide spraying, has not been determined. Chemical methods usually provide poor long-term control and are not always acceptable. The proximity of water tables creates high potential for water contamination. Even when chemical and mechanical control treatments are used, new seedlings can rapidly re-establish themselves from seeds in the soil.

OTHER STUDIES

The *Phalaris arundinacea* (reed canary grass) habitat type is described by Hansen and others (1995) for Montana. Michalsky and others (1994) describe a Reed Canary Grass vegetation type on the Grasslands National Park in extreme southern Saskatchewan.

Phragmites australis Habitat Type
(Reed Habitat Type)

PHRAAUS
Number of Stands Sampled = 12
Number of Stands Sampled in Saskatchewan = 6

LOCATION AND ASSOCIATED LANDFORMS

The *Phragmites australis* (reed) habitat type is an incidental type at lower elevations in the Moist Mixed Grassland and Aspen Parkland Ecoregions of Saskatchewan. It occurs in swales, marshes, pond and lake margins, oxbow lakes, backwater areas, and banks of rivers and streams. Sites are classified as seasonally flooded.

VEGETATION

Phragmites australis (reed) is a strongly rhizomatous perennial that generally forms tall (2-3 m [6.5-10 ft in height]), dense, monotypic stands (Table 69). Some stands may be quite extensive.

Table 69. Average canopy cover, range of canopy cover, and constancy for species recorded in 6 late seral to climax stands of the *Phragmites australis* (reed) habitat type

TABLE 69.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Graminoids			
Phragmites australis(reed)	98	98-98	100
Forbs			
Cirsium undulatum (wavy-leaved thistle)	3	0-3	17

TABLE 69.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Sonchus arvensis (perennial sow-thistle)	1	0-1	17

SUCCESSIONAL INFORMATION

Phragmites australis (reed) can pioneer suitable sites and persist indefinitely under suitable hydrologic conditions. The sites are generally so wet as to preclude most forms of disturbance. *Phragmites australis* (reed) is a strongly rhizomatous perennial that tends to out compete all but the most aggressive disturbance-caused herbaceous species. However, with increased disturbance, weedy species such as *Cirsium arvense* (Canada thistle) may invade (Table 70).

Table 70. Average canopy cover, range of canopy cover, and constancy for species recorded in 6 disturbed and/or early to mid-seral stands of the *Phragmites australis* (reed) habitat type

TABLE 70.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Graminoids			
Bromus inermis (awnless brome)	1	0-1	17
Calamagrostis stricta (narrow reed grass)	3	0-3	17
Carex atherodes (awned sedge)	1	0-1	17
Carex laeviconica (smooth-fruited sedge)	20	0-20	17
Carex rostrata (beaked sedge)	3	0-3	17
Eleocharis palustris (creeping spike-rush)	10	0-10	17
Phalaris arundinacea (reed canary grass)	1	0-1	17
Phragmites australis (reed)	83	80-98	100
Scirpus validus (common great bulrush)	3	0-3	17
Forbs			
Cicuta maculata (water-hemlock)	1	0-1	17
Circaea alpina (small enchanter's nightshade)	1	0-1	17
Cirsium arvense (Canada thistle)	11	0-20	50
Glycyrrhiza lepidota (wild licorice)	20	0-20	17
Lycopus asper (western water-horehound)	3	0-3	17
Melilotus alba (white sweet-clover)	20	0-20	17
Mentha arvensis (wild mint)	1	0-1	17
Moehringia lateriflora (blunt-leaved sandwort)	3	0-3	17
Polygonum lapathifolium (pale persicaria)	1	0-1	17
Potentilla norvegica (rough cinquefoil)	1	0-1	17
Rumex crispus (curled dock)	20	0-20	17
Scutellaria galericulata (marsh skullcap)	1	0-1	33
Sonchus arvensis (perennial sow-thistle)	10	0-10	17
Urtica dioica (common nettle)	3	0-3	17

SOILS

Soils are generally Entisols (Aquents) and Mollisols (Aquolls). Soil texture ranges from clay to sandy loam. Sites frequently experience prolonged flooding. Water tables fluctuate tremendously, particularly in drawdown areas, ranging from 50 cm (20 in) above to 1 m (39 in) below the soil surface at the end of the growing season.

ADJACENT COMMUNITIES

Adjacent wetter sites may be dominated by the *Typha latifolia* (common cattail) or the *Scirpus acutus* (great bulrush) habitat types. In some situations, wetter communities may be the open water. Adjacent drier sites may be dominated by a variety of communities including the *Salix exigua* (sandbar willow) community type, cottonwood community types, or sedge types. In some instances, upland species may dominate drier sites.

MANAGEMENT INFORMATION

Livestock

Herbage production in the *Phragmites australis* (reed) habitat type is high to very high. *Phragmites australis* (reed) is highly palatable to both livestock and wildlife, especially when the plants are young and growing vigorously. *Phragmites australis* (reed) is moderately tolerant of grazing. However, heavy grazing pressure may reduce the size and extent of stands. *Phragmites australis* (reed) produces good quality hay or silage on those rare years when the sites might dry enough to allow entry by machinery.

Wildlife

Phragmites australis (reed) is highly palatable to both livestock and wildlife, especially when the plants are young and growing vigorously. The high structural diversity of *Phragmites australis* (reed) provides excellent thermal and hiding cover for big game species. Waterfowl use this habitat type for nesting and hiding cover. Other birds such as red-winged blackbirds and yellow-headed blackbirds are also common inhabitants.

Fisheries

The *Phragmites australis* (reed) habitat type provides excellent streambank protection. The rhizomes hold and stabilize the bank while the above ground vegetation helps trap and filter sediments.

Soil Management and Rehabilitation Opportunities

Phragmites australis (reed) can provide excellent streambank protection. Rhizomes hold and stabilize the bank while the above ground vegetation helps trap and filter sediments. Once established, these characteristics help to stabilize the site.

Recreational Uses and Considerations

The *Phragmites australis* (reed) habitat type provides excellent opportunities for viewing wildlife.

OTHER STUDIES

Similar communities have been described by Ward (1942), Walker and Waygood (1968), and Shay and Shay (1986).

Poa pratensis Community Type
(Kentucky Bluegrass Community Type)

POAPRAT
Number of Stands Sampled = 8
Number of Stands Sampled in Saskatchewan = 1

LOCATION AND ASSOCIATED LANDFORMS

The *Poa pratensis* (Kentucky bluegrass) community type is an incidental type in Saskatchewan with the best examples found on mesic alluvial terraces having been subjected to past abusive grazing. Although the species is widespread across southern Saskatchewan as a member of disturbed, moist communities, sites dominated by *Poa pratensis* (Kentucky bluegrass) are not common.

VEGETATION

The *Poa pratensis* (Kentucky bluegrass) community type represents a grazing disclimax. *Poa pratensis* (Kentucky bluegrass) is a European meadow grass that is widely introduced and naturalized in North America. Stands are may be almost pure *Poa pratensis* (Kentucky bluegrass), or they may be a mixture of herbaceous “weedy” species dominated by *Poa pratensis* (Kentucky bluegrass). This type represents one of the drier of the herbaceous riparian or wetland community types (Table 71).

Table 71. Average canopy cover, range of canopy cover, and constancy for species recorded in 8 sampled stands of the grazing disclimax *Poa pratensis* (Kentucky bluegrass) community type

TABLE 71.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Shrubs			
Rosa spp. (rose)	1	0-1	13
Salix petiolaris (basket willow)	1	0-1	13
Graminoids			
Agropyron dasystachyum (northern wheat grass)	1	0-1	13
Agropyron repens (quack grass)	12	0-20	25
Agrostis scabra (rough hair grass)	3	0-3	13
Agropyron spicatum (bluebunch wheat grass)	3	0-3	13
Agrostis stolonifera (redtop)	15	0-20	25
Agropyron trachycaulum (slender wheat grass)	1	0-1	13
Bromus inermis (awnless brome)	10	0-10	13
Carex atherodes (awned sedge)	1	0-1	13
Carex simulata (sedge)	1	0-1	13
Dactylis glomerata (orchard grass)	1	0-1	13
Distichlis stricta (salt grass)	3	0-3	13
Hordeum jubatum (foxtail barley)	3	0-3	13
Juncus balticus (wire rush)	20	0-30	38
Koeleria macrantha (June grass)	1	0-1	13
Phleum pratense (timothy)	9	0-20	38
Poa palustris (fowl bluegrass)	30	0-30	13
Poa pratensis (Kentucky bluegrass)	79	60-98	100
Sphenopholis obtusata (prairie wedge grass)	1	0-1	13
Forbs			
Achillea millefolium (common yarrow)	10	0-20	25
Arnica chamissonis (leafy arnica)	20	0-20	13
Aster ascendens (western aster)	1	0-1	25
Aster brachyactis (rayless aster)	3	0-3	13
Aster ericoides (tufted white prairie aster)	20	0-20	13
Aster hesperius (western willow aster)	3	0-3	13
Astragalus miser (timber milk vetch)	10	0-10	13
Cerastium arvense (field mouse-ear chickweed)	1	0-1	13
Cirsium arvense (Canada thistle)	8	0-20	38
Cirsium scariosum (thistle)	1	0-1	13
Descurainia sophia (flixweed)	1	0-1	13
Grindelia squarrosa (gumweed)	1	0-1	13
Iris missouriensis (western blue flag)	1	0-1	25
Lactuca pulchella (common blue lettuce)	3	0-3	13
Linum lewisii (wild blue flax)	1	0-1	13
Medicago lupulina (black medick)	10	0-10	13
Melilotus alba (white sweet-clover)	10	0-10	13
Plantago major (common plantain)	20	0-20	13
Potentilla anserina (silverweed)	5	0-10	38
Potentilla gracilis (graceful cinquefoil)	1	0-1	25
Ferns and Allies			
Equisetum hyemale (common scouring-rush)	1	0-1	13

SUCCESSIONAL INFORMATION

The *Poa pratensis* (Kentucky bluegrass) community type represents a grazing disclimax of an early/mid-seral secondary successional stage. Overgrazing has caused drastic changes on sites formerly dominated by native graminoids (Volland 1978). Once a suitable site is disturbed, the extensive rhizome system of *Poa pratensis* (Kentucky bluegrass) allows it to rapidly spread onto these areas. It also withstands high levels of utilization, making replacement by former dominants such as *Deschampsia cespitosa* (tufted hair grass) unlikely.

The *Poa pratensis* (Kentucky bluegrass) community type represents a disturbance seral stage of many types including the *Deschampsia cespitosa* (tufted hair grass) and the *Agropyron smithii* (western wheat grass) habitat types. Close observation of similar sites may give insight to the climax community for the site.

SOILS

Soils are typically Brown and Dark Brown Chernozems or occasionally Regosols. *Poa pratensis* (Kentucky bluegrass) thrives on moist, fertile sandy to clay alluvial soils high in organic matter. It also survives, but grows less vigorously on sands, dense clays, and thin, rocky soils when adequate moisture is available. *Poa pratensis* (Kentucky bluegrass) is generally intolerant of prolonged flooding, seasonally high water tables, or poor drainage. It is tolerant of mildly alkaline (pH 8.0) and saline soils.

ADJACENT COMMUNITIES

Wetter sites support a wide range of communities including those within the *Populus* (cottonwood), *Salix* (willow), *Potentilla fruticosa* (shrubby cinquefoil), *Carex atherodes* (awned sedge), and *Juncus balticus* (wire rush) types. Adjacent drier sites may be dominated by wide variety of upland species.

MANAGEMENT INFORMATION

Livestock

The *Poa pratensis* (Kentucky bluegrass) community type is moderately productive, and provides a significant amount of early season forage. It is highly palatable in the rapid growth phase with palatability becoming greatly reduced during semi dormancy of late summer and winter. Fall regrowth can occur if moisture is sufficient and temperatures remain above freezing. *Poa pratensis* (Kentucky bluegrass) is well adapted to grazing and is considered an increaser or an invader, especially if grazing intensities and durations are severe (Wasser 1982). This species can produce new shoots from both existing tillers and rhizomes. Grazing practices influence the growth form present (Volland 1978). A high density of weak, low vigour tillers results under season-long grazing. Early season rest increases the vigour of individual plants. Fewer shoots may be produced, but total aboveground biomass tends to be greater. Streambanks with *Poa pratensis* (Kentucky bluegrass) stands are very susceptible to hoof shear damage.

Wildlife

Elk and deer make use of the grasses and forbs of this community type, especially in early spring when other forages have not yet greened. Waterfowl utilize *Poa pratensis* (Kentucky bluegrass) for food and cover. Upland game birds, small mammals, and small nongame birds use this type for cover (Dittberner and Olson 1983).

Fisheries

The *Poa pratensis* (Kentucky bluegrass) community type is ineffective in stabilizing streambanks (Youngblood and others 1985b). Bank undercutting and sloughing may occur, especially when soils are wet or excessive grazing weakens stands.

Fire

Poa pratensis (Kentucky bluegrass) is well adapted to fire, and quickly resprouts after burning. However, it is intolerant of burning during the active growth stages and can be successfully controlled by late spring burning. Fire is an effective tool to remove excessive litter accumulations common on rested or lightly grazed stands. Cool burns will have little effect on *Poa pratensis* (Kentucky bluegrass) (Volland and Dell 1981), but spring burns may lower tiller densities (Dix and Smeins 1967).

Soil Management and Rehabilitation Opportunities

The potential for soil compaction is greatest in spring when soils are moist. *Poa pratensis* (Kentucky bluegrass) has an extensive rhizome system, but its shallow rooting habit make it only marginally effective in stabilizing streambanks. The potential for erosion problems associated with this community type are quite high. Managers need to pay close attention to streambanks with the *Poa pratensis* (Kentucky bluegrass) community type to detect early signs of bank failure. Once a streambank starts to degrade, with no change in management there is little that can be done to save it short of expensive reconstructive treatments.

Unless water tables are restored, these degraded sites will retain their dominant cover of introduced grasses. On those sites adjacent to a first or second order stream, the use of rock check dams to aid in the rehabilitation of degraded (de-watered) sites is an excellent and cost effective approach. The rock dam will help raise the water table, thereby allowing willows and sedges to reclaim a degraded site.

OTHER STUDIES

The *Poa pratensis* (Kentucky bluegrass) community type is described by Hansen and others (1995) for Montana. A number of other researchers have identified similar *Poa pratensis* (Kentucky bluegrass) communities, including Norton and others (1981; Greys River, Wyoming), Ratliff (1982; Sierra Nevada, California), Youngblood and others (1985b; eastern Idaho and western Wyoming), and Padgett and others (1989; Utah and southeastern Idaho).

Polygonum coccineum Community Type (Water Smartweed Community Type)

POLYCOC

Number of Stands Sampled = 11

Number of Stands Sampled in Saskatchewan = 4

LOCATION AND ASSOCIATED LANDFORMS

The *Polygonum coccineum* (water smartweed) community type is a minor type in southern Saskatchewan. It occupies shallow water along the edges of reservoirs, lakes, ponds, marshes, and often comprises the wettest community at the centre of shallow depressional wetlands.

VEGETATION

The *Polygonum coccineum* (water smartweed) community type is an aggressive invader of shallow water and exposed mud flats where there is minimal wave action. It forms dense, monospecific stands (Table 72).

Table 72. Average canopy cover, range of canopy cover, and constancy for species recorded in 10 sampled stands of the *Polygonum coccinium* (water smartweed) community type

TABLE 72.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Shrubs			
Salix exigua (sandbar willow)	1	0-1	9
Graminoids			
Beckmannia syzigachne (slough grass)	20	0-20	9
Carex aquatilis (water sedge)	20	0-40	18
Carex atherodes (awned sedge)	5	0-10	18
Eleocharis palustris (creeping spike-rush)	3	0-3	9
Hordeum jubatum (foxtail barley)	3	0-3	9
Scirpus spp. (bulrush)	1	0-1	9
Forbs			
Unknown Forb	1	0-1	9
Polygonum amphibium (water smartweed)	94	80-98	100
Rumex crispus (curled dock)	3	0-3	9
Sagittaria cuneata (arum-leaved arrowhead)	1	0-1	9

SUCCESSIONAL INFORMATION

The *Polygonum coccineum* (water smartweed) community type is an early seral (pioneer) primary successional stage of a variety of habitat types. Careful observation of site characteristics will aid in determining the potential of the site. Such sites are often within the water level fluctuation (drawdown) zone of a lake, and are never free of flooding for sufficient time to reach vegetative potential; but instead are repeatedly reset to this early seral stage.

SOILS

The *Polygonum coccineum* (water smartweed) community type occurs on most soil textures from fine clay to sandy loam. The community type is intolerant of very saline or alkaline conditions. It is tolerant of frequent and prolonged flooding.

ADJACENT COMMUNITIES

Adjacent wetter communities may be the *Typha latifolia* (common cattail) or the *Scirpus acutus* (great bulrush) habitat type, or open water. Adjacent drier communities are a wide variety of types including upland types.

MANAGEMENT INFORMATION

Livestock

Herbage production of the *Polygonum coccineum* (water smartweed) community type rates low to moderate. The species has low palatability for livestock and wildlife.

Wildlife

Polygonum coccineum (water smartweed) has low palatability for wildlife. However, a wide variety of waterfowl may use these sites for nesting or nest building.

Soil Management and Rehabilitation Opportunities

Shore vegetation around reservoirs is a mosaic or concentric series of bands of short-lived plant communities that survive one or more years before being eliminated by a combination of high water, grazing, and/or seral succession. These shore communities are composed primarily of early seral species that become established when water levels are low. Repeated annual drawdowns perpetuate the disturbance and associated vegetation.

Shore vegetation is important as habitat for terrestrial wildlife, certain fish species, and for livestock. These communities also protect shores from erosion, and enhance aesthetic quality of the shore environment.

OTHER STUDIES

A *Polygonum coccineum* (water smartweed) community type is described by Hansen and others (1995) for Montana. A number of authors have described similar communities for the prairie pothole region of North America (Van der Valk 1989).

Puccinellia nuttalliana Habitat Type
(Nuttall's Salt-meadow Grass)

PUCCNUT

Number of Stands Sampled = 22

Number of Stands Sampled in Saskatchewan = 6

LOCATION AND ASSOCIATED LANDFORMS

The *Puccinellia nuttalliana* (Nuttall's salt-meadow grass) habitat type is a minor type in the Mixed Grassland and Moist Mixed Grassland Ecoregions of Saskatchewan. The type is found in saline or alkali basins, swales, pond and lake margins, and seep areas.

VEGETATION

The *Puccinellia nuttalliana* (Nuttall's salt-meadow grass) habitat type is usually identified by stands dominated by *Puccinellia nuttalliana* (Nuttall's salt-meadow grass) with the frequent presence of *Distichlis stricta* (salt grass) and *Hordeum jubatum* (foxtail barley) (Table 73).

Table 73. Average canopy cover, range of canopy cover, and constancy for species recorded in 6 late seral to climax stands of the *Puccinellia nuttalliana* (Nuttall's salt-meadow grass) habitat type

TABLE 73.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Graminoids			
Distichlis stricta (salt grass)	40	0-40	50
Hordeum jubatum (foxtail barley)	2	0-3	33
Puccinellia nuttalliana (Nuttall's salt-meadow grass)	84	60-98	100
Scirpus paludosus (prairie bulrush)	3	0-3	17
Forbs			
Salicornia europaea (samphire)	3	0-3	17
Triglochin maritima (seaside arrow-grass)	3	0-3	17

SUCCESSIONAL INFORMATION

High grazing use of this habitat type will weaken the *Puccinellia nuttalliana* (Nuttall's salt-meadow grass). With prolonged heavy use, *Hordeum jubatum* (foxtail barley) and a variety of disturbance-related, alkali tolerant forbs increase (Table 74).

Table 74. Average canopy cover, range of canopy cover, and constancy for species recorded in 16 early to mid seral or disturbed stands of the *Puccinellia nuttalliana* (Nuttall's salt-meadow grass) habitat type

TABLE 74.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Shrubs			
Atriplex nuttallii (Nuttall's atriplex)	1	0-1	6
Graminoids			
Agropyron trachycaulum (slender wheat grass)	3	0-3	6
Beckmannia syzigachne (slough grass)	20	0-20	6
Calamagrostis stricta (narrow reed grass)	1	0-1	6
Carex lanuginosa (woolly sedge)	10	0-10	6
Carex rostrata (beaked sedge)	3	0-3	6
Carex spp. (sedge)	20	0-20	6
Distichlis stricta (salt grass)	38	0-80	44
Eleocharis palustris (creeping spike-rush)	7	0-10	13
Hordeum jubatum (foxtail barley)	19	0-60	56
Juncus balticus (wire rush)	1	0-1	6
Juncus bufonius (toad rush)	80	0-80	6
Puccinellia nuttalliana (Nuttall's salt-meadow grass)	75	50-98	100
Scirpus paludosus (prairie bulrush)	1	0-1	13
Scirpus pungens (three-square rush)	10	0-20	13
Spartina gracilis (alkali cord grass)	20	0-20	6
Forbs			
Aster brachyactis (rayless aster)	7	0-10	13
Aster ericoides (tufted white prairie aster)	1	0-1	6
Atriplex spp. (atriplex)	10	0-10	6
Atriplex prostrata (prostrate saltbush)	3	0-3	13
Bassia hyssopifolia (five-hook bassia)	1	0-1	6
Chenopodium album (lamb's-quarters)	10	0-10	6
Grindelia squarrosa (gumweed)	3	0-3	6
Haplopappus lanceolatus (lance-leaved ironplant)	3	0-3	6
Ranunculus cymbalaria (seaside buttercup)	10	0-10	6
Rumex maritimus (golden dock)	1	0-1	6
Sagittaria cuneata (arum-leaved arrowhead)	3	0-3	6
Salicornia europaea (samphire)	10	0-20	31
Salsola kali (Russian-thistle)	10	0-10	6
Sonchus arvensis (perennial sow-thistle)	1	0-1	6
Sonchus spp. (sow-thistle)	1	0-1	6
Suaeda calceoliformis (western sea-blite)	10	0-20	13
Triglochin concinnum (graceful arrow-grass)	3	0-3	6
Triglochin maritima (seaside arrow-grass)	8	0-20	25
Triglochin palustris (slender arrow-grass)	3	0-3	6

SOILS

Parent material is commonly alluvium. Soils are typically Brown Chernozems. Texture ranges from clay to silt loam. Water tables usually remain at or slightly below the soil surface. Soil reaction is commonly alkaline (pH 8.0). Soils of this type characteristically have high concentrations of soluble salts (saline soils).

ADJACENT COMMUNITIES

This type is often at the lowest (wettest) level of the local drainage. On other sites, adjacent wetter communities may be dominated by the *Scirpus pungens* (three-square rush). Drier communities may be dominated by *Sarcobatus vermiculatus* (greasewood), *Distichlis stricta* (salt grass), or a variety of upland communities. Adjacent sites that are even more saline may be dominated by *Salicornia europaea* (samphire).

MANAGEMENT INFORMATION

Livestock

Forage production in this type rates as moderate to low. *Puccinellia nuttalliana* (Nuttall's salt-meadow grass) is moderately palatable to livestock. With prolonged heavy use, *Hordeum jubatum* (foxtail barley) may replace the *Puccinellia nuttalliana* (Nuttall's salt-meadow grass).

Wildlife

The *Puccinellia nuttalliana* (Nuttall's salt-meadow grass) habitat type is of limited value as wildlife habitat. It provides some cover, forage, and nesting habitat for waterfowl.

Fire

The response to, and utility of, fire in the *Puccinellia nuttalliana* (Nuttall's salt-meadow grass) habitat type is not well known at this time.

Soil Management and Rehabilitation Opportunities

The high clay content and saline nature common to theses soils make them extremely susceptible to compaction. They present limitations to development. New trails or roads should be located outside this type on the adjacent uplands.

Recreational Uses and Considerations

Recreational use of this type is extremely limited. Campsites, roads, and trails should located elsewhere due to the high clay content of this type.

OTHER STUDIES

The *Puccinellia nuttalliana* (Nuttall's salt-meadow grass) dominance type is described by Hansen and others (1988) for Montana.

Salicornia europaea Community Type (Samphire Community Type)

SALIEUR
Number of Stands Sampled = 14
Number of Stands Sampled in Saskatchewan = 7

LOCATION AND ASSOCIATED LANDFORMS

The *Salicornia europaea* (samphire) community type is a minor type at lower elevations southern Saskatchewan. The *Salicornia europaea* (samphire) community type occurs in the drawdown zone of saline or alkaline seeps, basins, swales, and pond and lake margins. This zone is flooded during the early part of the growing season but the water table falls below the soil surface by late spring or early summer. This drawdown zone supports narrow bands of different communities surrounding the open water. The soil surface is typically covered with salt crusts.

VEGETATION

Harsh soil conditions allow the annual, *Salicornia europaea* (samphire), to occur in nearly pure stands. In some cases, *Distichlis stricta* (salt grass), *Hordeum jubatum* (foxtail barley), and *Puccinellia nuttalliana* (Nuttall's salt-meadow grass) and other salt tolerant species may be present (Table 75).

Table 75. Average canopy cover, range of canopy cover, and constancy for species recorded in the 14 stands of the *Salicornia europaea* (samphire) community type

TABLE 75.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Graminoids			
Deschampsia cespitosa (tufted hair grass)	3	0-3	7
Distichlis stricta (salt grass)	3	0-3	7
Hordeum jubatum (foxtail barley)	3	0-3	21
Puccinellia nuttalliana (Nuttall's salt-meadow grass)	2	0-3	29
Forbs			
Chenopodium leptophyllum (narrow-leaved goosefoot)	3	0-3	7
Kochia scoparia (summer-cypress)	2	0-3	14
Opuntia polyacantha (prickly-pear)	1	0-1	7
Polygonum convolvulus (wild buckwheat)	3	0-3	7
Polygonum ramosissimum (bushy knotweed)	1	0-1	7
Salicornia europaea (samphire)	69	30-90	100
Suaeda calceoliformis (western sea-blite)	20	0-20	7

SUCCESSIONAL INFORMATION

The *Salicornia europaea* (samphire) community type is an early seral (pioneer) primary successional stage representing a variety of site salt-tolerant types. Limited information suggests that the *Salicornia europaea* (samphire) community type may be successional to the *Distichlis stricta* (salt grass) or the *Puccinellia nuttalliana* (Nuttall's salt-meadow grass) habitat types. The *Salicornia europaea* (samphire) community type occupies the seasonal drawdown areas that are generally too wet for *Distichlis stricta* (salt grass).

SOILS

Soils are generally Solonetzics. Texture is commonly clay. Soils are poorly to very poorly drained, with water tables remaining slightly below the soil surface or dropping below 1 m (39 in) in some years. Water movement is slow enough that it evaporates and becomes concentrated with salts (sodium and magnesium sulfates), forming crusts on the surface and on objects protruding out of the water. Soil reaction is alkaline (pH 8.0) with high concentrations of soluble salts (saline soils).

ADJACENT COMMUNITIES

There are usually no wetter communities adjacent to *Salicornia europaea* (samphire) because in this region this species is the most alkali tolerant vascular plant species. Adjacent drier communities may be dominated by *Puccinellia nuttalliana* (Nuttall's salt-meadow grass), *Distichlis stricta* (salt grass), or *Hordeum jubatum* (foxtail barley).

MANAGEMENT INFORMATION

Livestock

Forage production is very low. *Salicornia europaea* (samphire) is unpalatable but associated grasses may provide limited forage.

Wildlife

Due to the extremely low forage production and short stature of the *Salicornia europaea* (samphire) (<1 dm in height [<4 in]), it is of little value to wildlife.

Soil Management and Rehabilitation Opportunities

Most management concerns associated with this type are centered on the increasing problems with saline seep. The presence or expansion of seep areas may indicate that upland vegetation, small grains, fallow fields, or excess irrigation are not allowing the water table to drop to levels these sites have routinely experienced in the past. Excess water then flows through the soil, gathering soluble salts before evaporating in depressions. The salts remain, increasing in concentration over time, limiting the number of plant species able to tolerate this environment. However, it is important to note that saline areas occur naturally due to the arid climate, parent material, and local topography.

OTHER STUDIES

The *Salicornia europaea* (samphire) community type is described by Hansen and others (1995) for Montana. A similar community has been described by Jorgensen (1979) for the Yellow Water Triangle of central Montana, and by Lesica and Shelly (1988) for the Blackfeet Indian Reservation.

Scirpus acutus Habitat Type
(Great Bulrush Habitat Type)

SCIRACU

Number of Stands Sampled = 41

Number of Stands Sampled in Saskatchewan = 12

Note: The *Scirpus acutus* (great bulrush) habitat type includes all combinations of *Scirpus acutus* (great bulrush) and *Scirpus validus* (common great bulrush) due to similarities in environmental conditions and management concerns.

LOCATION AND ASSOCIATED LANDFORMS

The *Scirpus acutus* (great bulrush) habitat type is a major type in the Saskatchewan Prairie Ecozone. Typical locations include marshes and the margins of ponds and lakes in water up to about 2 m (6.5 ft) deep.

VEGETATION

The *Scirpus acutus* (great bulrush) habitat type typically occurs as a fringe along the margins of ponds and lakes. It also occupies basins where water tables remain relatively high but may drop below the soil surface later during the growing season. Except for its common associate *Typha latifolia* (common cattail), other species are largely absent from this type, or present in limited amounts (Table 76).

Table 76. Average canopy cover, range of canopy cover, and constancy for species recorded in 26 late seral to climax stands of the *Scirpus acutus* (great bulrush) habitat type

TABLE 76.	**% Can. Cov.**		
Species	**Avg.**	**Rng.**	**Con.**
Graminoids			
Carex lanuginosa (woolly sedge)	1	0-1	4
Scirpus acutus (great bulrush)	88	0-98	81
Scirpus pungens (three-square rush)	1	0-1	4
Scirpus validus (common great bulrush)	70	0-80	19
Forbs			
Chenopodium album (lamb's-quarters)	1	0-1	4
Lemna minor (common duckweed)	3	0-3	4
Lycopus asper (western water-horehound)	3	0-3	4
Polygonum amphibium (water smartweed)	3	0-3	8
Rumex maritimus (golden dock)	3	0-3	4
Sagittaria cuneata (arum-leaved arrowhead)	1	0-1	8
Sium suave (water parsnip)	1	0-1	4
Typha latifolia (common cattail)	7	0-10	8

SUCCESSIONAL INFORMATION

Scirpus acutus (great bulrush) and *Scirpus validus* (common great bulrush) are early colonizers of suitable habitats that are able to persist under wet conditions. Due to continually saturated conditions and the aggressive characteristic of *Scirpus acutus* (great bulrush), most other species are precluded.

Under drought conditions, sites may dry out enough to allow livestock access sufficient to alter the vegetation community by reducing cover of the tall *Scirpus* species (bulrush) and allowing in such disturbance and drier species as *Hordeum jubatum* (foxtail barley) and *Polygonum* species (smartweed) (Table 77).

Table 77. Average canopy cover, range of canopy cover, and constancy for species recorded in 15 disturbed and/or early to mid-seral stands of the *Scirpus acutus* (great bulrush) habitat type

TABLE 77.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Graminoids			
Agropyron repens (quack grass)	40	0-40	7
Agrostis scabra (rough hair grass)	1	0-1	7
Alopecurus aequalis (short-awned foxtail)	2	0-3	13
Beckmannia syzigachne (slough grass)	2	0-3	13
Calamagrostis canadensis (bluejoint)	3	0-3	7
Carex aquatilis (water sedge)	3	0-3	7
Carex atherodes (awned sedge)	7	0-10	13
Carex rostrata (beaked sedge)	1	0-1	7
Eleocharis spp. (spike-rush)	30	0-30	7
Eleocharis palustris (creeping spike-rush)	40	0-40	7
Hordeum jubatum (foxtail barley)	26	0-90	40
Phalaris arundinacea (reed canary grass)	3	0-3	7
Poa palustris (fowl bluegrass)	1	0-1	7
Scirpus acutus (great bulrush)	79	0-98	93
Scirpus paludosus (prairie bulrush)	10	0-10	7
Scirpus validus (common great bulrush)	30	0-30	7
Forbs			
Aster brachyactis (rayless aster)	3	0-3	7
Chenopodium album (lamb's-quarters)	7	0-10	13
Chenopodium rubrum (red goosefoot)	3	0-3	7
Epilobium ciliatum (northern willowherb)	10	0-10	7
Epilobium palustre (marsh willowherb)	1	0-1	7
Unknown Forb	10	0-10	13
Kochia scoparia (summer-cypress)	3	0-3	13
Lycopus asper (western water-horehound)	10	0-10	7
Mentha arvensis (wild mint)	4	0-10	20
Polygonum amphibium (water smartweed)	15	0-20	13
Polygonum lapathifolium (pale persicaria)	2	0-3	13
Polygonum ramosissimum (bushy knotweed)	3	0-3	7
Rumex crispus (curled dock)	7	0-10	13
Rumex maritimus (golden dock)	10	0-10	7
Sagittaria cuneata (arum-leaved arrowhead)	1	0-1	13
Senecio congerminus (Arctic butterweed)	1	0-1	7
Sonchus arvensis (perennial sow-thistle)	1	0-1	7
Sparganium spp. (sparganium)	1	0-1	7
Typha latifolia (common cattail)	2	0-3	20
Urtica dioica (common nettle)	1	0-1	7
Xanthium strumarium (cocklebur)	30	0-30	7
Ferns and Allies			
Equisetum fluviatile (swamp horsetail)	80	0-80	7

SOILS

Soils are commonly Humic Gleysols or occasionally Organic. Water tables are generally at or above the soil surface throughout the growing season. Soil reaction varies from neutral to moderately alkaline (pH 7.0 to 8.0).

ADJACENT COMMUNITIES

The *Typha latifolia* (common cattail) habitat type is often adjacent to this type, especially where surface water persists year round. Drier sites support the *Carex atherodes*, (awned sedge), *Carex rostrata* (beaked sedge) and *Carex aquatilis* (water sedge), *Poa pratensis* (Kentucky bluegrass), and *Salix* (willow) types.

MANAGEMENT INFORMATION

Livestock

Wet conditions and the lack of palatable forage limit livestock use of this type. However, if upland forage becomes limited and soil conditions become dry, livestock may use the *Scirpus acutus* (great bulrush).

Wildlife

Scirpus acutus (great bulrush) provides valuable nesting and roosting cover for a variety of songbirds and waterfowl, notably red winged and yellow-headed blackbirds. *Scirpus acutus* (great bulrush) is a staple food for muskrats and is used in construction of their huts. Seeds of *Scirpus acutus* (great bulrush) are eaten by a variety of birds. Waterfowl managers often attempt to increase the proportion of *Scirpus acutus* (great bulrush) relative to *Typha* species (cattail) as a means of improving habitat.

Fisheries

Scirpus acutus (great bulrush), along with other shallow water emergent species, provides critical springtime spawning habitat for pike (Harrison 2000).

Fire

The *Scirpus acutus* (great bulrush) habitat type will burn in late fall or early spring if water levels have fallen.

Soil Management and Rehabilitation Opportunities

Soils are commonly wet throughout the growing season and easily damaged from trampling by livestock and wildlife.

OTHER STUDIES

The *Scirpus acutus* (great bulrush) habitat type is described by Hansen and others (1995) for Montana. Similar communities dominated by *Scirpus acutus* (great bulrush) have been identified by Pierce and Johnson (1986) for west central Montana and by Chadde and others (1988) for northern Yellowstone National Park.

Scirpus paludosus Habitat Type
(Prairie Bulrush Habitat Type)

SCIRPAU
Number of Stands Sampled = 23
Number of Stands Sampled in Saskatchewan = 11

LOCATION AND ASSOCIATED LANDFORMS

The *Scirpus paludosus* (prairie bulrush) habitat type is a minor type in southern Saskatchewan. Sites are commonly located in alkaline or saline areas such as semi-permanently flooded shallow edges of marshes and ponds. The *Scirpus pungens* (three-square rush) habitat type occurs in similar positions on the landscape as the *Scirpus paludosus* (prairie bulrush) habitat type, but has a slightly drier hydrologic regime.

VEGETATION

The *Scirpus paludosus* (prairie bulrush) habitat type usually forms dense, monotypic stands. In some instances, limited amounts of the shorter *Eleocharis palustris* (creeping spike-rush) may be present (Table 78).

Table 78 Average canopy cover, range of canopy cover, and constancy for species recorded in 18 late seral to climax stands of the *Scirpus paludosus* (prairie bulrush) habitat type

TABLE 78.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Graminoids			
Eleocharis palustris (creeping spike-rush)	3	0-3	6
Hordeum jubatum (foxtail barley)	2	0-3	17
Puccinellia nuttalliana (Nuttall's salt-meadow grass)	1	0-1	11
Scirpus paludosus (prairie bulrush)	92	60-98	100
Scirpus validus (common great bulrush)	1	0-1	6
Forbs			
Atriplex spp. (atriplex)	1	0-1	6
Bassia hyssopifolia (five-hook bassia)	1	0-1	6
Chenopodium album (lamb's-quarters)	2	0-3	11

SUCCESSIONAL INFORMATION

Scirpus paludosus (prairie bulrush) is an early colonizer of suitable habitats and can persist on a site under wet conditions. Permanently wet conditions usually inhibit most forms of disturbance.

Under drought conditions, sites may dry out enough to allow livestock access sufficient to alter the vegetation community by reducing cover of the tall *Scirpus* species (bulrush) and allowing in such disturbance and drier species as *Eleocharis palustris* (creeping spike-rush) and *Hordeum jubatum* (foxtail barley) (Table 79).

Table 79 Average canopy cover, range of canopy cover, and constancy for species recorded in 5 disturbed and/or early to mid-seral stands of the *Scirpus paludosus* (prairie bulrush) habitat type

TABLE 79.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Shrubs			
Salix exigua (sandbar willow)	3	0-3	20
Salix lutea (yellow willow)	3	0-3	20
Graminoids			
Agropyron repens (quack grass)	1	0-1	20
Beckmannia syzigachne (slough grass)	1	0-1	20
Carex aquatilis (water sedge)	1	0-1	20
Eleocharis palustris (creeping spike-rush)	11	0-20	60
Glyceria borealis (northern manna grass)	10	0-10	20
Hordeum jubatum (foxtail barley)	8	0-20	60
Juncus nodosus (knotted rush)	1	0-1	20
Phalaris arundinacea (reed canary grass)	1	0-1	20
Scirpus acutus (great bulrush)	3	0-3	40
Scirpus paludosus (prairie bulrush)	78	60-98	100
Scirpus pungens (three-square rush)	20	0-20	20
Scolochloa festucacea (spangletop)	3	0-3	20
Forbs			
Atriplex spp. (atriplex)	10	0-10	20
Cicuta maculata (water-hemlock)	3	0-3	20
Glycyrrhiza lepidota (wild licorice)	3	0-3	20
Habenaria hyperborea (northern green bog orchid)	3	0-3	20
Mentha arvensis (wild mint)	10	0-10	20
Polygonum amphibium (water smartweed)	1	0-1	20
Potentilla anserina (silverweed)	1	0-1	20
Rumex crispus (curled dock)	3	0-3	20
Rumex maritimus (golden dock)	10	0-10	20
Sonchus arvensis (perennial sow-thistle)	3	0-3	20
Stellaria crassifolia (fleshy stitchwort)	1	0-1	20
Viola adunca (early blue violet)	1	0-1	20
Ferns and Allies			
Equisetum arvense (common horsetail)	10	0-10	20

SOILS

Soils are typically Humic Gleysols. Texture ranges from clay to loam. Water tables are high, often remaining above the soil surface throughout the growing season. Soils are poorly to very poorly drained, with available water estimates ranging from moderate to high. Soil reaction is generally alkali (pH 8.5). Saline soils are also common to this habitat type.

ADJACENT COMMUNITIES

Adjacent wetter sites may be occupied by the *Typha latifolia* (common cattail) or the *Scirpus acutus* (great bulrush) habitat types, or by open water. Adjacent drier sites may include a wide variety of types such as the *Spartina pectinata* (prairie cord grass), *Puccinellia nuttalliana* (Nuttall's salt-meadow grass), or the *Distichlis stricta* (salt grass) habitat types, or the *Salicornia europaea* (samphire) community type.

MANAGEMENT INFORMATION

Livestock

Herbage production is moderate to very high. However, palatability is low to moderate. *Scirpus paludosus* (prairie bulrush) is seldom grazed by livestock or wildlife, provided other forage is available. However, if the site dries enough and upland forage is limited, livestock may heavily utilize these communities.

Wildlife

The *Scirpus paludosus* (prairie bulrush) habitat type is an important source of shade, hiding cover, and food for some wildlife species. It is used by muskrats for construction of huts. Waterfowl use this type for nesting and hiding cover. Other birds, such as red-winged blackbirds and yellow-headed blackbirds, are common inhabitants. Deer also use this site type for hiding cover.

Fisheries

The *Scirpus paludosus* (prairie bulrush) habitat type buffers wind and wave action on bodies of water. Warm water fish may make use of this site type as spawning beds. Along streams, this site type helps to filter out sediments and build streambanks.

Soil Management and Rehabilitation Opportunities

The *Scirpus paludosus* (prairie bulrush) habitat type helps filter sediments to build streambanks. This type is fairly drought tolerant, and can persist through several years of dry conditions. *Scirpus paludosus* (prairie bulrush) is a prolific seed producer. Dissemination occurs by both wind and water. Seeds require moist, bare soil for germination. Rhizomes spread into exposed areas, rapidly colonizing mudflats and drawdown areas.

OTHER STUDIES

This type is described by Hansen and others (1995) under the synonym name *Scirpus maritimus* (alkali bulrush) habitat type. Similar sites in the prairie pothole region of the northern Great Plains have been described by Van der Valk (1989).

Scirpus pungens Habitat Type
(Three-square Rush Habitat Type)

SCIRPUN
Number of Stands Sampled = 33
Number of Stands Sampled in Saskatchewan = 10

LOCATION AND ASSOCIATED LANDFORMS

The *Scirpus pungens* (three-square rush) habitat type is a minor type in southern Saskatchewan. Sites are located in wet areas such as along smaller streams (usually perennial), and the edges of marshes and ponds. The

Scirpus paludosus (prairie bulrush) habitat type occurs in similar, but slightly wetter, positions on the landscape.

VEGETATION

The *Scirpus pungens* (three-square rush) habitat type usually forms dense stands dominated by *Scirpus pungens* (three-square rush) (Table 80).

Table 80. Average canopy cover, range of canopy cover, and constancy for species recorded in 12 late seral to climax stands of the *Scirpus pungens* (three-square rush) habitat type

TABLE 80.	**% Can. Cov.**		
Species	**Avg.**	**Rng.**	**Con.**
Shrubs			
Salix exigua (sandbar willow)	3	0-3	8
Graminoids			
Calamagrostis stricta (narrow reed grass)	3	0-3	8
Carex lanuginosa (woolly sedge)	3	0-3	8
Eleocharis acicularis (needle spike-rush)	1	0-1	8
Hordeum jubatum (foxtail barley)	1	0-1	17
Scirpus paludosus (prairie bulrush)	1	0-1	8
Scirpus pungens (three-square rush)	91	70-98	100
Scirpus validus (common great bulrush)	1	0-1	8
Forbs			
Lycopus asper (western water-horehound)	1	0-1	8
Polygonum arenastrum (common knotweed)	1	0-1	8
Rumex crispus (curled dock)	1	0-1	8
Rumex triangulivalvis (narrow-leaved dock)	1	0-1	8
Typha latifolia (common cattail)	3	0-3	8
Xanthium strumarium (cocklebur)	3	0-3	8

SUCCESSIONAL INFORMATION

Scirpus pungens (three-square rush) is an early colonizer of suitable habitats and is able to persist under wet conditions. Due to continual saturation and the aggressive habit of *Scirpus pungens* (three-square rush), most other species are precluded. Wet conditions usually limit most disturbances other than occasional trampling by livestock. Disturbance can dramatically increase the amount of disturbance-related species such as *Hordeum jubatum* (foxtail barley) and *Juncus balticus* (wire rush) (Table 81).

Table 81. Average canopy cover, range of canopy cover, and constancy for species recorded in 21 disturbed and/or early to mid-seral stands of the *Scirpus pungens* (three-square rush) habitat type

TABLE 81.	**% Can. Cov.**		
Species	**Avg.**	**Rng.**	**Con.**
Trees			
Populus deltoides (plains cottonwood)	1	0-1	5
Shrubs			
Salix amygdaloides (peach-leaved willow)	1	0-1	5
Salix exigua (sandbar willow)	1	0-1	5
Symphoricarpos occidentalis (buckbrush)	5	0-10	10
Graminoids			
Agrostis scabra (rough hair grass)	3	0-3	10
Agropyron smithii (western wheat grass)	5	0-10	14
Agropyron trachycaulum (slender wheat grass)	3	0-3	5
Carex aquatilis (water sedge)	2	0-3	10
Carex nebraskensis (Nebraska sedge)	3	0-3	5
Carex retrorsa (turned sedge)	3	0-3	5
Deschampsia cespitosa (tufted hair grass)	3	0-3	5
Eleocharis palustris (creeping spike-rush)	18	0-50	29
Elymus virginicus (Virginia wild rye)	3	0-3	5
Hordeum jubatum (foxtail barley)	6	0-60	76
Juncus alpinoarticulatus (alpine rush)	2	0-3	10
Juncus balticus (wire rush)	16	0-20	24
Juncus nodosus (knotted rush)	1	0-1	5
Phalaris arundinacea (reed canary grass)	10	0-10	5

TABLE 81.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Poa pratensis (Kentucky bluegrass)	10	0-20	10
Polypogon monspeliensis (rabbitfoot grass)	1	0-1	5
Puccinellia nuttalliana (Nuttall's salt-meadow grass)	3	0-3	14
Scirpus acutus (great bulrush)	1	0-1	5
Scirpus microcarpus (small-fruited bulrush)	1	0-1	5
Scirpus paludosus (prairie bulrush)	5	0-10	14
Scirpus pungens (three-square rush)	71	20-98	100
Spartina pectinata (prairie cord grass)	12	0-20	10
Forbs			
Aster brachyactis (rayless aster)	2	0-3	10
Aster ericoides (tufted white prairie aster)	1	0-1	5
Aster spp. (aster)	20	0-20	5
Atriplex spp. (atriplex)	2	0-3	10
Atriplex prostrata (prostrate saltbush)	2	0-3	10
Chenopodium album (lamb's-quarters)	10	0-10	10
Chenopodium spp. (goosefoot)	1	0-1	5
Cirsium arvense (Canada thistle)	3	0-3	10
Epilobium leptophyllum (narrow-leaved willowherb)	3	0-3	5
Unknown Forb	5	0-10	10
Glycyrrhiza lepidota (wild licorice)	7	0-10	10
Grindelia squarrosa (gumweed)	3	0-3	5
Kochia scoparia (summer-cypress)	1	0-1	5
Melilotus officinalis (yellow sweet-clover)	3	0-3	5
Mentha arvensis (wild mint)	20	0-20	5
Potentilla anserina (silverweed)	5	0-10	24
Ranunculus cymbalaria (seaside buttercup)	2	0-3	14
Ranunculus spp. (ranunculus)	1	0-1	5
Rumex crispus (curled dock)	1	0-3	19
Rumex maritimus (golden dock)	1	0-1	5
Salicornia europaea (samphire)	40	0-40	5
Senecio pauperculus (balsam groundsel)	1	0-1	5
Sonchus arvensis (perennial sow-thistle)	20	0-30	10
Sonchus asper (prickly annual sow-thistle)	1	0-1	5
Sonchus spp. (sow-thistle)	3	0-3	5
Sonchus uliginosus (smooth perennial sow-thistle)	1	0-1	5
Trifolium spp. (clover)	1	0-1	5
Triglochin maritima (seaside arrow-grass)	20	0-20	5
Triglochin palustris (slender arrow-grass)	7	0-10	10
Typha latifolia (common cattail)	1	0-1	5
Xanthium strumarium (cocklebur)	17	0-30	10
Ferns and Allies			
Equisetum arvense (common horsetail)	10	0-10	5

SOILS

Soils are typically Humic Gleysols. Texture ranges from clay to loam. Water tables are high, remaining within 1 m (39 in) of the soil surface throughout the year. Soils are rated as somewhat poorly drained to poorly drained. Soil reaction is typically alkali (pH 8.5). Saline soils are also common. Lesica and Shelly (1988) measured soil water conductivities of this type to range from 2,920 to 41,000 uhmos/cm (a median of 81,000 uhmos/cm) on the Blackfeet Indian Reservation in Montana.

ADJACENT COMMUNITIES

Adjacent wetter sites along streams are usually occupied by *Eleocharis palustris* (creeping spike-rush). Other adjacent wetter sites include open water, the *Typha latifolia* (common cattail), or the *Scirpus acutus* (great bulrush) habitat types. Adjacent drier sites include a wide variety of types, including the *Spartina pectinata* (prairie cord grass), the *Distichlis stricta* (salt grass), or the *Agropyron smithii* (western wheat grass) habitat types; and the *Salicornia europaea* (samphire) community type. In other situations, drier sites may be classified as upland sites.

MANAGEMENT INFORMATION

Livestock

Herbage production is high to very high. However, palatability is low to moderate. *Scirpus pungens* (three-square rush) is seldom grazed by livestock or wildlife, if other forage is available or if the site is very wet. However, if water levels drop or upland forage is limited, livestock may heavily utilize these communities.

Wildlife

The *Scirpus pungens* (three-square rush) habitat type can be an important source of shade, hiding cover, and food for wildlife. *Scirpus pungens* (three-square rush) is used by muskrats for construction of huts. Waterfowl use this site type for nesting and hiding cover. Other birds such as red-winged blackbirds and yellow-headed blackbirds are common inhabitants. Deer also use this site type for hiding cover.

Fisheries

The *Scirpus pungens* (three-square rush) habitat type buffers wind and wave action on bodies of water. Warm water fish may make use of this site type as spawning beds. Along streams, this site type helps to filter out sediments and build streambanks.

Soil Management and Rehabilitation Opportunities

The *Scirpus pungens* (three-square rush) habitat type helps filter sediments to build streambanks. This type is fairly drought tolerant being able to persist through several years of dry conditions. *Scirpus pungens* (three-square rush) is a prolific seed producer. Dissemination occurs by both wind and water. Seeds require moist, bare soil for germination. Rhizomes spread into exposed areas, rapidly colonizing mudflats and drawdown areas.

OTHER STUDIES

The *Scirpus pungens* (three-square rush) habitat type is described by Hansen and others (1995) for Montana. Lesica and Shelly (1988) described a similar community for the Blackfeet Indian Reservation. Similar sites in the prairie pothole region of the northern Great Plains have been described by Van der Valk (1989).

Scolochloa festucacea Habitat Type
(Spangletop Habitat Type)

SCOLFES

Number of Stands Sampled = 13

Number of Stands Sampled in Saskatchewan = 12

LOCATION AND ASSOCIATED LANDFORMS

The *Scolochloa festucacea* (spangletop) habitat type is a minor type at lower elevations in the Saskatchewan Prairie Ecozone. It occurs in swales, marshes, pond and lake margins, oxbow lakes, backwater areas, and banks of rivers and streams.

VEGETATION

Scolochloa festucacea (spangletop) is a strongly rhizomatous perennial that generally forms tall (2-3 m [6.5-10 ft in height]), dense, monotypic stands (Table 82). Some stands may be quite extensive in size.

Table 82. Average canopy cover, range of canopy cover, and constancy for species recorded in 13 stands of the *Scolochloa festucacea* (spangletop) habitat type

TABLE 82.	**% Can. Cov.**		
Species	**Avg.**	**Rng.**	**Con.**
Graminoids			
Agrostis stolonifera (redtop)	3	0-3	8
Beckmannia syzigachne (slough grass)	1	0-1	8
Carex atherodes (awned sedge)	4	0-10	38
Eleocharis palustris (creeping spike-rush)	20	0-20	8
Hordeum jubatum (foxtail barley)	2	0-3	15
Phalaris arundinacea (reed canary grass)	1	0-1	8
Scirpus acutus (great bulrush)	2	0-3	15
Scolochloa festucacea (spangletop)	94	60-98	100
Forbs			
Cicuta maculata (water-hemlock)	3	0-3	8
Polygonum coccineum (water smartweed)	1	0-1	8
Sonchus spp. (sow-thistle)	1	0-1	8
Typha latifolia (common cattail)	2	0-3	15

SUCCESSIONAL INFORMATION

The sites are generally so wet as to preclude most forms of disturbance. *Scolochloa festucacea* (spangletop) is a strongly rhizomatous perennial that tends to out compete all but the most aggressive disturbance-caused herbaceous species. However, with increased disturbance, weedy species such as *Sonchus* spp. (sow-thistle) may invade.

SOILS

Soils are typically Regosols or less frequently, Chernozems with fine texture and reactions ranging from slightly acid to moderately alkaline (pH 6.5 to 8.0) (USDA Soil Conservation Service 1968). Commonly, soils are poorly drained. Water tables may be above the soil surface for several months in the spring, and soils often remain saturated throughout the growing season. *Scolochloa festucacea* (spangletop) can tolerate prolonged periods of flooding.

ADJACENT COMMUNITIES

Adjacent wetter sites may include open water or the *Carex atherodes* (awned sedge), *Typha latifolia* (common cattail), *Scirpus acutus* (great bulrush), and *Eleocharis palustris* (creeping spike-rush) habitat types. Adjacent drier sites support a variety of species including: *Bromus inermis* (awnless brome), *Populus* (cottonwood), *Salix* (willow), and the *Acer negundo/Prunus virginiana* (Manitoba maple/choke cherry) habitat type.

MANAGEMENT INFORMATION

Scolochloa festucacea (spangletop) is a recently defined habitat type; therefore, very little management information is presently available. Beetle (1977) states that it is a constituent of marsh hay and, if locally abundant, may be a species of limited importance. It probably has a low value for grazing due to its coarseness.

OTHER STUDIES

The *Scolochloa festucacea* (spangletop) dominance type is described by Hansen and others (1988) for Montana.

Typha latifolia Habitat Type
(Common Cattail Habitat Type)

TYPHLAT
Number of Stands Sampled = 53
Number of Stands Sampled in Saskatchewan = 10

Note: The *Typha latifolia* (common cattail) habitat type includes all combinations of *Typha latifolia* (common cattail) and *Typha angustifolia* (narrow-leaved cattail) due to similarities in environmental conditions and management concerns.

LOCATION AND ASSOCIATED LANDFORMS

The *Typha latifolia* (common cattail) habitat type is a major type in the Saskatchewan Prairie Ecozone. This type commonly occurs along lake and pond margins, ditches, oxbows, and backwater areas.

VEGETATION

Continually saturated or inundated conditions tend to limit species diversity within this type. *Typha latifolia* (common cattail) is dominant, with *Typha angustifolia* (narrow-leaved cattail) occurring in some stands (Table 83).

Table 83. Average canopy cover, range of canopy cover, and constancy for species recorded in 40 late seral to climax stands of the *Typha latifolia* (common cattail) habitat type

TABLE 83.	**% Can. Cov.**		
Species	**Avg.**	**Rng.**	**Con.**
Graminoids			
Eleocharis palustris (creeping spike-rush)	10	0-20	5
Scirpus acutus (great bulrush)	20	0-20	3
Scirpus validus (common great bulrush)	3	0-3	3
Forbs			
Cicuta maculata (water-hemlock)	1	0-1	3
Mentha arvensis (wild mint)	3	0-3	3
Polygonum amphibium (water smartweed)	3	0-3	5
Typha latifolia (common cattail)	92	80-98	100

SUCCESSIONAL INFORMATION

Typha latifolia (common cattail) and *Typha angustifolia* (narrow-leaved cattail) are early colonizers of suitable habitats and are able to persist under wet conditions. The species are well adapted to prolonged submergence of the roots and lower stems, but some period of bare soil exposure is required for germination and seedling establishment. Because seed production is extremely high, they are capable of rapid colonization of wet mineral soils. Due to the saturated soils and high water levels throughout the growing season, most forms of disturbance minimally impact the sites. However, if the site does dry out, heavy livestock use can converts these stands to the *Hordeum jubatum* (foxtail barley) community type or some other slightly drier disturbance-related species dominance. Disturbance generally increases dramatically the number of species present (Table 84).

Table 84. Average canopy cover, range of canopy cover, and constancy for species recorded in 16 disturbed and/or early to mid-seral stands of the *Typha latifolia* (common cattail) habitat type

TABLE 84.	**% Can. Cov.**		
Species	**Avg.**	**Rng.**	**Con.**
Trees			
Populus deltoides (plains cottonwood)	3	0-3	6
Shrubs			
Salix exigua (sandbar willow)	3	0-3	6
Salix scouleriana (Scouler's willow)	3	0-3	6

TABLE 84.	% Can. Cov.		
Species	**Avg.**	**Rng.**	**Con.**
Graminoids			
Beckmannia syzigachne (slough grass)	3	0-3	6
Carex atherodes (awned sedge)	7	0-10	13
Carex rostrata (beaked sedge)	8	0-10	19
Eleocharis palustris (creeping spike-rush)	8	0-20	19
Unknown Grass	2	0-3	13
Hordeum jubatum (foxtail barley)	20	0-20	6
Phalaris arundinacea (reed canary grass)	20	0-20	6
Poa pratensis (Kentucky bluegrass)	10	0-10	6
Scirpus acutus (great bulrush)	5	0-10	13
Scirpus pungens (three-square rush)	50	0-50	6
Scirpus validus (common great bulrush)	50	0-80	19
Forbs			
Chenopodium pratericola (goosefoot)	20	0-20	6
Cicuta maculata (water-hemlock)	20	0-20	6
Cirsium arvense (Canada thistle)	2	0-3	19
Epilobium ciliatum (northern willowherb)	10	0-10	6
Equisetum fluviatile (swamp horsetail)	3	0-3	6
Unknown Forb	30	0-30	6
Galium trifidum (small bedstraw)	1	0-1	6
Lycopus asper (western water-horehound)	1	0-1	6
Mentha arvensis (wild mint)	14	0-20	19
Polygonum lapathifolium (pale persicaria)	7	0-10	13
Rumex maritimus (golden dock)	3	0-3	6
Sagittaria latifolia (broad-leaved arrowhead)	40	0-40	6
Senecio conterminus (Arctic butterweed)	1	0-1	6
Sium suave (water parsnip)	20	0-20	6
Sparganium spp. (sparganium)	3	0-3	6
Typha latifolia (common cattail)	83	50-98	100
Urtica dioica (common nettle)	1	0-1	6

SOILS

Soils are commonly Gleysols, often characterized by accumulations of organic matter overlying deposits of fine silt and clay. These types are commonly inundated with 30-100 cm (12-39 in) of water throughout the year. Redoximorphic features (mottling or gleying) in mineral horizons are common.

ADJACENT COMMUNITIES

Scirpus acutus (great bulrush) is a common dominant of sites with similar water regimes, although *Scirpus acutus* (great bulrush) appears to tolerate more brackish conditions than *Typha latifolia* (common cattail). The *Carex atherodes* (awned sedge) habitat type frequently occupies adjacent drier sites.

MANAGEMENT INFORMATION

Livestock

Typha latifolia (common cattail) is normally little used by livestock. However, if the site dries sufficiently, or upland forage is limited, livestock may heavily utilize this type.

Wildlife

Typha latifolia (common cattail) is an important source of shade, hiding cover, and food for wildlife. This species is a highly preferred food of muskrats (Allen and Hoffman 1984). It is also used by muskrats for construction of huts. Waterfowl use this type for nesting and hiding cover, if the stands are not too dense. Dense stands will hinder waterfowl uses. Deer also use this type for forage and hiding cover. The type is a critical source of nesting and roosting cover for yellow headed and redwinged blackbirds.

Fire

Dense stands of *Typha latifolia* (common cattail) can be burned in late fall or early spring in order to improve nesting season habitat for waterfowl.

Soil Management and Rehabilitation Opportunities

Standing water and continually wet conditions restrict most development on these sites.

OTHER STUDIES

The *Typha latifolia* (common cattail) habitat type is described by Hansen and others (1995) for Montana. Pierce and Johnson (1986) and Chadde and others (1988) described similar *Typha latifolia* (common cattail) communities. A similar community is described by Padgett and others (1989) for Utah and southeastern Idaho.

OTHER TYPES (NOT DESCRIBED)

Some stands sampled do not fit any of the types described in the text. Most of these are cases where the type is rarely present in the Saskatchewan Prairie Ecoregion but is more common in adjacent regions outside the study area. Some of these "possible" types were not actually sampled, but stands containing potential sample plots were observed. We feel that a minimum of three stands of a community needs to have been observed before consideration as a type for description and inclusion in the key.

The following types possibly occur in the study area, but were not observed in more than rare abundance, or are types that we believe to be present in limited abundance.

Deciduous Trees Types

***Quercus macrocarpa/Prunus virginiana* (bur oak/choke cherry) habitat type**---One plot was sampled in southeastern Saskatchewan along the Oxbow River. Other stands of *Quercus macrocarpa* (bur oak) were observed in Moose Mountain Provincial Park and along tributaries to the Qu'Appelle River.

Coniferous Trees Types

***Picea glauca/Equisetum arvense* (white spruce/common horsetail) habitat type**—This type may occur infrequently in the Cypress Hills highlands. It was found in Alberta near Elkwater Lake and farther north in the Battle River valley near the Saskatchewan border.

Willow Shrub Types

***Salix candida* (hoary willow) community type**—Small *Salix candida* (hoary willow) stands were found in the Cypress Hills and near Diefenbaker Lake and Lac Pelletier. These stands contained *Cornus stolonifera* (red-osier dogwood), *Potentilla fruticosa* (shrubby cinquefoil), and *Carex rostrata* (beaked sedge).

***Salix lucida* (shining willow)**—One plot was sample in Southeastern Saskatchewan near the Oxbow River. More stands may possibly be present in other riparian areas associated with fresh water.

***Salix discolor* (pussy willow)**—One plot was sampled near Diefenbaker Lake. More stands may possibly be present in other riparian areas associated with fresh water.

Non-Willow Shrub Types

***Cornus stolonifera* (red-osier dogwood) community type**—No samples plots were collected of this type, but stands containing potential plots of *Cornus stolonifera* (red-osier dogwood) were observed along the Frenchman River.

***Elaeagnus angustifolia* (Russian olive) community type**—Isolated pockets of *Elaeagnus angustifolia* (Russian olive) were observed in the Mixed Grass Ecoregion but no stands large enough to contain a sample plot.

Sedge Types

***Carex Rostrata* (beaked sedge) habitat type**—This type was not sampled, but potential stands were observed around Diefenbaker Lake. More stands may possibly be present in other riparian areas associated with fresh water.

Herbaceous Types

The following Herbaceous Types may occur within the Saskatchewan Prairie Ecoregion, but no stands were observed that were large enough to qualify as a sample plot. Not enough is presently known about these potential types to be able to predict where they might geographically occur.

Non-Sedge Graminoids

Eleocharis quinqueflora (few-flowered spike-rush)
Glyceria borealis (northern manna grass)
Poa palustris (fowl bluegrass)

Forbs

Glycyrrhiza lepidota (wild licorice)

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GLOSSARY

Abandoned Meander Channel. A former stream channel that was cut off from the rest of the river and typically lacks year-long standing water.

Aerobic. Condition in which molecular oxygen is present in the environment.

Alkaline. Water or soil with a pH greater than 7.4.

Alluvial Soil. Sediments (clay, silt, sand, gravel, cobbles, and boulders) deposited by running water, ordinarily occurring on floodplains and at the base of ridges and slopes.

Alluvial Terrace. Deposits of alluvial soil that mark former floodplains. Typically, a floodplain may have several sets of alluvial terraces at different elevations and of different ages (the higher the elevation, the older the age).

Alluvium. An accumulation of sediments deposited by streams or rivers.

Anaerobic. Condition in which molecular oxygen is absent from the environment. This commonly occurs in wetlands where soils experience prolonged saturation by water.

Aquatic Bed (Cowardin and others 1979). A class of wetland and deepwater habitat dominated by plants that grow principally on or below the surface of the water for most of the growing season in most years.

Aquic Conditions. These soils experience continuous or periodic saturation and reduction. The presence of these conditions is indicated by redoximorphic features.

Aquic Moisture Regime (obsolete). A moisture condition associated with a seasonal reducing environment that is virtually free of dissolved oxygen because the soil is saturated by ground water or by water of the capillary fringe, as in soils in Aquic suborders and Aquic subgroups.

Available Water Capacity. The ability of a soil to hold water in a form available to plants; expressed in inches of water per inch of soil depth. Classes are: 1) Low = 0 - 0.12, 2) Moderate = 0.13 - 0.17, and 3) High = > 0.17.

Average Canopy Cover. The "average" canopy cover of a species in those stands in which it was recorded. For example, the number of stands sampled for a habitat type or community type may be 20, but if a particular species occurs in 7 of the 20 stands, then the average canopy cover is the "average" canopy cover of that particular species on those 7 stands.

Backwater Area. Seasonal or permanent water bodies found in the lowest parts of floodplains, typically circular or oval.

Bars (Alluvial). Sediment accumulations along waterways deposited by moving water. Examples include: 1) point bars — bars that are formed on the inside of a meander channel, 2) side bars — bars that are formed along the edges of relatively straight sections of a river, 3) mid-channel bars — these are found within the channel and generally become more noticeable during low flow periods, and 4) delta bars — formed immediately downstream of the confluences of a tributary and the main river.

Beaver Dams. Dams built by beavers that span the stream channel. In general, water is still flowing through the riparian system.

Bog (Mitsch and Gosselink 1986). A sphagnum moss-dominated community whose only water source is rainwater. They are extremely low in nutrients, form acidic peats, and are a northern phenomenon generally associated with low temperatures and short growing seasons.

Browse. Shrubby and woody forage consumed by wildlife.

Canopy Coverage. The percentage of ground covered by the gross outline of an individual plant's foliage; or collectively covered by all individuals of a species within a stand or a sample plot.

Capillary Fringe. A zone immediately above the water table in which water is drawn upward from the water table by capillary action.

Carr. Wetland on organic soil with greater than 25 percent cover of shrubs. Typically, carrs are dominated by willows (Salix species).

Climax Community. Refers to the final or steady state plant community that is self-perpetuating and in dynamic equilibrium with its environment.

Colluvium. A deposit of unconsolidated geologic materials and soil accumulated at the base of slopes because of gravity.

Community (Plant Community). An assembly of plants living together, reflecting no particular ecological status.

Community Type. An aggregation of all plant communities distinguished by floristic and structural similarities in both overstory and undergrowth layers. A unit of vegetation within a classification. For the purposes of this document, a community type represents seral vegetation, and it is never considered to be climax.

Constancy. The constancy of occurrence of a species in stands samples of a habitat type or community type. It is the percentage of stands sampled of that habitat type or community type in which a particular species is recorded.

Disclimax. Where recurring disturbances, such as grazing (e.g., zootic disclimax) or periodic burning (e.g., fire disclimax), exert the predominant influence in maintaining the structure and composition of the steady-state vegetation. Disclimaxes, such as the zootic climax or fire climax, are not the basis for recognizing habitat types.

Diversity. The kind and amount of species in a community per unit area.

Drained. A condition in which ground or surface water has been removed by artificial means.

Dominance Type (Equivalent to Cover Type). An aggregation of all stands (individual plant communities) grouped and named simply by the species with the greatest canopy coverage in the overstory or upper layer. In this classification, canopy cover of dominant species is greater than 25 percent.

Emergent Plant. A rooted herbaceous plant species that has parts extending above a water surface.

Emergent Wetland (Cowardin and others 1979). A class of wetland habitat characterized by erect, rooted, herbaceous hydrophytes, excluding mosses and lichens.

Entisols. A soil order including soils of slight or recent development; common along rivers and floodplains.

Ephemeral Stream. A stream or stretch of a stream that flows only in direct response to precipitation. It receives no water from springs and no long-continued supply from melting snow or other surface source. Its stream channel is at all times above the water table. These streams do not normally flow for 30 consecutive days.

Fen (Mitsch and Gosselink 1986). A non-acidic peat-forming wetland that receives nutrients form sources other than precipitation, usually through groundwater movement.

Fibric Materials. Plant materials that show very little signs of decomposition. Plant fiber content before rubbing between fingers is at least 3/4 of the soil volume.

Flooded. A condition in which the soil surface is temporarily covered with flowing water from any source, such as streams overflowing their banks and runoff from adjacent or surrounding slopes, or any combination of sources.

Floodplain. An alluvial plain caused by the overbank deposition of alluvial material. Typically appearing as flat expanses of land bordering a stream or river. Most floodplains are accompanied by a series of alluvial terraces of varying levels.

Fluvial. Pertaining to or produced by the action of moving water.

Forb. An herbaceous plant, usually broadleaved, that is not a graminoid.

Forested Wetland (Cowardin and others 1979). A class of wetland habitat characterized by woody vegetation that is 6 m (20 ft) tall or taller.

Forested Wetlands. Occur near springs and seeps and in areas with naturally high water tables, such as river floodplains. Two general types of forested wetlands occur in Montana: 1) those dominated by coniferous tree species, and 2) those dominated by deciduous angiosperm tree species.

Frequently Flooded. A class of flood frequency in which flooding is common during most years (more than a 50 percent chance of flooding in any year, or more than 50 times in 100 years).

Gallery Forest. A strip of forest confined to a stream margin or floodplain in an otherwise unforested landscape.

Gleization. A process in saturated or nearly saturated soils, which involves the reduction of iron. This process tends to give gray colours (low chroma) to those parts of the soil from which the iron has been reduced or removed, and rust colours (high chroma) to those where the iron has oxidized and accumulated.

Gleyed Soil (obsolete). A soil condition resulting from prolonged soil saturation, which is manifested by the presence of bluish or greenish colours through the soil mass or in mottles (spots or streaks) among other colours. Gleying occurs under reducing soil conditions resulting from soil saturation, by which iron is reduced predominantly to the ferrous state. See also redox depletions.

Graminoid. Grass or grass-like plant, such as species of the Poaceae (grasses), Cyperaceae (sedges), and Juncaceae (rushes).

Ground Water. Water occupying the interconnected pore spaces in the soil or geologic material below the water table, this water has a positive pressure.

Growing Season. The portion of the year when soil temperatures are above biologic zero (41° F) as defined by Soil Taxonomy; the following growing season months are assumed for each of the soil temperature regimes: 1) thermic (February-October), 2) mesic (March-October), 3) frigid (May-September), 4) cryic (June-August), and 5) pergelic (July-August).

Habitat Type. The land area that supports, or has the potential of supporting, the same primary climax vegetation. A habitat type classification is a vegetation-based ecological site classification. It is based on the potential of the site to produce a specific plant community (plant association).

Herbaceous. Nonwoody vegetation, such as graminoids and forbs.

Histic Epipedon. A 20 to 40 cm (8 to 16 in) soil layer at or near the surface that is saturated for 30 consecutive days or more during the growing season in most years and contains a minimum of 20 percent organic matter when no clay is present or a minimum of 30 percent of organic matter when 60 percent or more clay is present. Generally, a thin horizon of peat or muck is present if the soil has not been plowed.

Horizon. A distinct layer of soil, more or less parallel with soil surface, possessing similar properties such as colour, texture, and permeability. The soil profile is subdivided into the following major horizons: 1) A horizon — a surface horizon characterized by an accumulation of organic material; 2) E horizon — most commonly a surface horizon, characterized by leaching of organic material, iron, and clay; 3) B horizon — a subsurface horizon characterized by relative accumulation of organic matter, iron, clay, or aluminium; and 4) C horizon — undisturbed, unaltered parent material.

Hydrology. The science dealing with the properties, distribution, and circulation of water.

Hydrophyte. Any macrophytic plant that grows in water or on a substrate that is at least potentially deficient in oxygen because of excessive water content; plants typically found in wetland and other aquatic habitats.

Hydrophytic Vegetation. Plant life growing in water or on a substrate that is at least potentially deficient in oxygen because of excessive water content.

Incidental Type. Refers to a habitat type or community type that rarely occurs or occupies only a small area of a wetland zone.

Intermittent Stream. A stream or reach of stream that flows only at certain times of the year when it receives water from springs or from some surface source (e.g., melting snow). They are usually divided with respect to the source of their water into spring-fed or surface-fed intermittent streams. These streams generally flow continuously during periods of at least one month or more during the year.

Inundation. A condition in which water temporarily or permanently covers a land surface.

Irrigation Canal. Included all types of canals associated with irrigation systems.

Lacustrine System (Cowardin and others 1979). Any wetland or deepwater habitat with the following characteristics: 1) situated in a topographic depression or dammed river channel, 2) lacking trees, shrubs, persistent emergents, emergent mosses or lichens with greater than 30 percent areal coverage, and 3) total area exceeds 8 ha (20 acres).

Lake. A natural topographic depression collecting a body of water covering at least 8 ha (20 acres) with surface water.

Lentic Wetland. See **Still Water Wetland**.

Long Duration (Flooding). A duration class in which inundation for a single event ranges from 7 days to 1 month.

Lotic Wetland. See **Riparian Wetland**.

Major Type. Refers to a habitat type or community type that occupies an extensive area within a wetland zone.

Marsh. A frequently or continually inundated wetland **on often developing in** shallow ponds, depressions, and river margins. Marshes are dominated by herbaceous plants, such as grasses (e.g., Phragmites), sedges, cattails (e.g., Typha), and bulrushes (e.g., Scirpus). Waters are usually neutral to basic.

Mineral Soil. Soils composed of predominantly mineral materials (sands, silts, and clays) instead of organic materials. The soil contains less than 20 percent organic matter.

Minor Type. Refers to a habitat type or community type that seldom occupies large areas but may be common within a wetland zone.

Monotypic Stands. Stands composed primarily of a single species.

Montane. That region between the subalpine zone and the grassland zone or more broadly, mountain slopes below the alpine zone.

Mottling (obsolete). Spots or blotches of different colour or shades of colour interspersed within the dominant colour in a soil layer, usually resulting from the presence of periodic reducing soil conditions. See also redox concentrations.

Nonhydric Soils. A soil that has developed under predominantly unsaturated soil conditions.

Nonpersistent Vegetation. Plants that break down readily after the growing season; no evidence of previous year's growth at the beginning of the next grow season.

Nonwetland. Any area that has sufficiently dry conditions that hydrophytic vegetation, hydric soils, and/or wetland hydrology are lacking; it includes upland as well as former wetlands that are effectively drained.

Organic Soil. Soils composed of primarily organic rather than mineral material. Equivalent to Histosols and includes peats and mucks.

Overbank Flooding. Any situation in which inundation occurs due to the water level of a river or stream rising above bank level.

Overflow Channel. An abandoned channel in a floodplain that may carry water during periods of high stream or river flows.

Oxbow Lake. A meander channel of a stream or river that is formed by breaching of a meander loop during flood stage. The ends of the cut-off meander are blocked by bank sediments.

Palustrine System (Cowardin and others 1979). Any nontidal wetland of a class dominated by trees, shrubs, persistent emergents, or emergent mosses or lichens.

Parent Material. The unconsolidated and undeveloped mineral or organic matter from which the solum (soil) is developed.

Peraquic Moisture Regime. A soil condition in which reducing conditions always occur due to the presence of ground water at or near the soil surface.

Perennial Stream. A stream or reach of a stream that flows continuously. They are generally fed in part by springs. Surface water elevations are commonly lower than water table elevations in adjacent soils.

Permanently Flooded. A water regime condition where standing water covers the land surface throughout the year (but may be absent during extreme droughts).

Permeability. The quality of the soil that enables water to move downward through the profile, measured as the number of cm (in) per hour that water moves downward through the saturated soil.

Phase. A subdivision of a habitat type, or representing a characteristic variation in climax vegetation and environmental conditions.

Pioneer Species. Species that colonize bare areas (e.g., gravel bars) where there is little or no competition from other species.

Plant Association. Term used to group together all those stands of climax vegetation that occur in environments so similar that there is much floristic similarity throughout all layers of the vegetation.

Playa. A periodically flooded wetland basin. Playas are common in parts of southwest Montana.

Pond. Bodies of water encircled by wetland vegetation. Wave action is minimal, allowing emergent vegetation to establish.

Ponded. A condition in which free water covers the soil surface; for example, in a closed depression. The water is removed only by percolation, evaporated, or transpiration.

Pooled Channel Stream. An intermittent stream with significant surface pool area and without flowing surface water. The water sources for the pools are springs within the channel.

Poorly Drained. Water is removed from the soil so slowly that the soil is saturated periodically during the growing season or remains wet for long periods (greater than 7 days).

Pothole. A depressional wetland community caused by glaciation; common to portions of the Northern Great Plains. The body of water is less than 8 ha (20 acres) in size.

Primary Succession. Occurs on a bare surface not previously occupied by plants, such as a recently deposited alluvial bar.

Range Of Canopy Cover. Refers to the "range" (e.g., low and high values) of canopy cover of a particular species for all the stands sampled for a habitat type or community type.

Redox Concentrations. A redoximorphic feature characterized by zones in the soil of apparent accumulation of iron and manganese oxides. These may form as nodules, concretions, soft bodies, or pore linings and vary in shape, size, and colour.

Redox Depletions. A redoximorphic feature characterized by zones in the soil of low chroma (less than 3) where iron and manganese oxides alone have been removed, or where both iron/manganese oxides and clay have been removed.

Redoximorphic Features. Soil features, associated with wetness, that are formed because of the reduction and oxidation of iron and manganese compounds in the soil following saturation with water. (See redox concentrations and redox depletions).

Reduced Matrix. A redoximorphic feature characterized by a soil matrix having low chroma (less than 3) in situ, but increases in hue or chroma when exposed (within 30 minutes) to air.

Reservoir. An artificial (dammed) water body with at least 8 ha (20 acres) covered by surface water.

Riparian. *adj.* Of, on, or relating to the banks of a natural course of water (Latin riparius, from ripa, bank).

Riparian Plant Association. A plant community representing the latest successional stage attainable on a specific, hydrologically influenced surface (equivalent to potential natural community type).

Riparian Wetlands (Lotic Wetlands). Riparian wetlands are wetlands associated with running water systems found along rivers, streams, and drainageways. Such wetlands contain a defined channel and floodplain. The channel is an open conduit that periodically, or continuously, carries flowing water as well as dissolved and suspended material. Beaver ponds, seeps, springs, and wet meadows on the floodplain of, or associated with, a river or stream are part of the riparian wetland.

Riparian or Wetland Ecosystem. The ecosystem located between aquatic and terrestrial environments. Identified by hydric soil characteristics and riparian or wetland plant species that requires or tolerates free water conditions of varying duration.

Riparian or Wetland Species. Plant species occurring within the riparian or wetland zone. Obligate riparian or wetland species require the environmental conditions associated with the riparian or wetland zone. Facultative riparian or wetland species are tolerant of these environmental conditions, but also occur in uplands.

Riparian Zone. A geographically delineated portion of the riparian ecosystem based on management concerns.

River. Rivers are usually larger than streams. They flow year around, in years of normal precipitation, and when significant amounts of water are not being diverted out of them.

Riverbank. That portion of the channel bank cross-section that controls the lateral movement of water.

Riverine System (Cowardin and others 1979). Any wetland or deepwater habitat contained within a channel, with exception of wetlands dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens.

Salic Horizon. A mineral soil horizon 15 cm (6 in) or more thick enriched with secondary soluble salts.

Saline. Soil or water containing sufficient soluble salts to interfere with the growth of most plants.

Saturated. A soil condition in which all voids (pore spaces) between soil particles are filled with water.

Secondary Succession. The process of changing biotic communities that occurs following disturbances to a site that previously had been occupied by living organisms.

Seep. Groundwater discharge areas. In general, seeps have less flow than a spring.

Seral. Refers to vegetation that has not theoretically attained a steady state with its environment, and current populations of some species are being replaced by other species; a community or species that is replaced by another community or species as succession progresses.

Series. Refers to a group of habitat types having the same climax species.

Shrub. A multi-stemmed woody plant generally shorter than 4.8 m (16 ft).

Small Mountain Lake. A natural topographic depression collecting a body of water covering less than 8 ha (20 acres) with surface water.

Solum. The upper and most weathered part of the soil profile; the A and B horizons.

Somewhat Poorly Drained. Water is removed slowly enough that the soil is wet for significant periods during the growing season.

Spring. Groundwater discharge areas. In general, springs are considered to have more flow than seeps.

Stable Community. The condition of little or no perceived change in plant communities that are in relative equilibrium with existing environmental conditions. It describes persistent but not necessarily climax stages in plant succession.

Stand. A plant community that is relatively uniform in composition, structure, and habitat conditions; also, a sample unit.

Stream. A natural waterway that is defined as first to third order.

Streambank. That portion of the channel bank cross-section that controls the lateral movement of water.

Stream Order. A classification of streams according to the number of tributaries. Order 1 streams have no tributaries; a stream of order 2 or higher has 2 or more tributaries of the next lower order.

Still Water Wetlands (Lentic Wetlands). These wetlands occur in basins and lack a defined channel and floodplain. Included are permanent (e.g., perennial) or intermittent bodies of water such as lakes, reservoirs, potholes, marshes, ponds, and stockponds. Other examples include fens, bogs, wet meadows, and seeps not associated with a defined channel.

Stockpond. An artificial (dammed) body of water of less than 8 ha (20 acres) covered by surface water.

Subterranean Stream. A stream that flows underground for part of the stream reach.

Succession. The change or sequence of plant, animal, and microbial communities that successively occupy an area over a period of time. Primary succession begins on a bare surface not previously occupied by living organisms, such as a recently deposited gravel bar. Secondary succession occurs following disturbances on sites that previously supported living organisms.

Swale. A depression or topographical low area.

Sward. An expanse of grass or grass-like plants.

Tree. A single-stemmed woody plant generally taller than 4.8 m (16 ft).

Uplands. Any area that does not qualify as a wetland because the associated hydrologic regime is not sufficiently wet to elicit development of vegetation, soils, and/or hydrologic characteristics associated with wetlands. Such areas occurring in floodplains are more appropriately termed nonwetlands.

Very Long Duration (Flooding). A duration class in which inundation for a single event is greater than 1 month.

Very Poorly Drained. Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season.

Water Mark. A line on vegetation or other upright structures that represents the maximum height reached during a flood, ponding, or inundation event.

Water Table. The upper surface of the zone of saturation within the soil or geologic material.

Wet Meadow. An herbaceous wetland on mineral soil. Generally, wet meadows occur in seasonally flooded basins and flats. Soils are usually dry for part of the growing season.

Wetlands. Areas that under normal circumstances have hydrophytic vegetation, hydric soils, and wetland hydrology. It includes landscape units such as bogs, fens, carrs, marshes, and lowlands covered with shallow, and sometimes ephemeral or intermittent waters. Wetlands are also potholes, sloughs, wet meadows, riparian zones, overflow areas, and shallow lakes and ponds having submerged and emergent vegetation. Permanent waters of streams and water deeper than 3 m (approximately 10 ft) in lakes and reservoirs are not considered wetlands.

Wetland Hydrology. Permanent or periodic inundation or prolonged soil saturation sufficient to create anaerobic conditions in the soil. Primary wetland hydrology indicators are: inundated, saturated in upper 4.7 cm (12 in), water marks, drift lines, sediment deposits, drainage patterns in wetlands. Secondary wetland hydrology indicators are: oxidized root channels in upper 4.7 cm (12 in), water-stained leaves, local soil survey data, FAC-neutral test (Environmental Laboratory, 1987).